FACTORS AFFECTING ACADEMIC PERFORMANCE

EDUCATION IN A COMPETITIVE AND GLOBALIZING WORLD

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FACTORS AFFECTING ACADEMIC PERFORMANCE

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NOTICE TO THE READER

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CONTENTS

PROLOGUE

Nowadays, society is constantly changing, and new ways of life are being developed by due to nonstop technological advancements. This generates changes in family, schools, the media, etc. New technologies are creating virtual environments to manage learning and academic achievement, and this is a new challenge to approach formal and informal education. In the last few decades, teachers, families, and educational administrators had very well-defined fields of action and roles to play. Now, these roles are disfigured, and influences from all agents are arguable and more difficult to face.

At this current stage, problems sometimes appear that require different forms of intervention. Some of the problems are violence towards people; child abuse; drug abuse at increasingly early ages; integration problems due to immigration; dropping out of school; and typical problems related to student development, personality, disabilities, social and psychical maladjustment, teenagers' socioaffective relationships, etc. Research on school success and failure has a long history, but there is still no agreement concerning the prevalence of these variables to explain academic achievement, the relationship between those variables, and which other variables modulate their level of impact.

For many years, cognitive psychology has emphasized cognitive function as the most relevant for learning in school. However, recent studies highlight the importance of motivational and affective functions in building consistent models to explain learning and academic achievement. This change of perspective, from the classical cognitive model to a self-regulated learning model, has implied a new orientation in the research of the factors involved in school success and failure. Self-regulated learning models try to integrate students' cognitive, socioaffective, and behavioral aspects. These models describe the different components involved in successful learning at all school stages, explaining reciprocal relationships between those components and directly relating learning to personal achievement, motivation, volition, and emotions.

With this new paradigm, students not only contribute to strengthening their intelligence, but also their motivational and emotional qualities, all related to achieving personal balance.

This book presents studies, ideas, and recommendations to shed light on the complex educational world. Education has limits and difficulties, but it is also the only instrument that can develop students' potential into personal success.

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STUDENT ACHIEVEMENT PROMOTION: UNDERSTANDING THE COMPLEXITY OF PSYCHOEDUCATIONAL PROCESSES

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Chapter 1

STUDENT ACHIEVEMENT, MOTIVATION AND ACADEMIC ENGAGEMENT

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ABSTRACT

Engagement is defined here as a metaconstruct or a multidimensional construct with behavioral, emotional, and cognitive dimensions. We review different theoretical frameworks of achievement motivation which allow us to explain student involvement in learning tasks and differentiate a series of motivational variables, commonly associated with behavioral, emotional and cognitive engagement. The role of students' self-beliefs, valuing of academic work, purposes for engagement in learning and enjoyment in academic engagement are reviewed here.

Keywords: student engagement, achievement motivation, students' self-beliefs, subjective task value, achievement goal orientation, academic emotions

INTRODUCTION

Student Academic Engagement

Achievement motivation theorists attempt to explain people's choice of achievement tasks, persistence on those tasks, vigor in carrying them out, and performance on them. As Elliot and Dweck (2005) indicated in the first chapter of *Handbook of Competence and Motivation*, although psychologists across a diversity of disciplines recognize the existence of

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a body of research called "the achievement motivation literature," it is possible that few would be able to articulate the specific contents of this literature. This lack of coherence and a clear set of structural parameters have negative implications for both empirical efforts and theory development. As the authors suggest, the absence of a clear definition of "achievement" may be behind the weaknesses of achievement motivation literature. A cumulative body of achievement motivational studies easy to interpret individually is difficult to interpret as a whole because it is laborious to build explanatory theoretical models of motivation without a solid conceptual differentiation of achievement measures. Here, we intend to address the students' achievement motivation considering different theoretical frameworks together which may allow us to distinguish a number of motivational factors that have been consistently related to student behavioral, cognitive and emotional engagement.

Engaged students do more than attending or performing academically. They put forth good effort, persist, regulate their behavior towards goals and select and adjust appropriate strategies for learning. They also challenge themselves to exceed their own expectations enjoying challenges and learning. In a recent search of the literature about engagement, Azevedo (2015) found that engagement has been used to describe student academic performance and achievement; classroom behaviors; students' self-perceptions of beliefs, students' enactment of cognitive, motivational, affective, metacognitive, and social processes and so on. In Azevedo's words (2015, 84) "*engagement is one of the most widely misused and overgeneralized constructs found in the educational, learning, instructional, and psychological sciences.*"

Upon the suggestion of Fredricks, Blumenfeld and Paris (2004), engagement is best viewed as a metaconstruct or a multidimensional construct with behavioral, emotional, and cognitive dimensions. According to this perspective, behavioral engagement refers to actions such as attendance and participation in school activities, emotional engagement includes a sense of belonging or valuing of the school and cognitive engagement refers to students' cognitive strategies and effort investment in learning and comprehension.

Behavioral engagement can be operationalized as involvement in one's own learning and academic tasks. Measures of behavioral engagement include displays of effort, persistence and behavioral aspects of attention. This construct also included self-directed academic behavior such as exhibiting resiliency in the face of obstacles or purposefully seeking out information without prompting or assistance (Buhs and Ladd 2001). The link between behavioral engagement and achievement has been robust within educational research. This association may be due primarily to the types of assessment used, which are typically low-level tests based on simple recall of instructions or attendance records. Behavioral engagement may not be a good predictor of achievement on exams or tasks that require higher order processing strategies, because one could be behaviorally engaged without strong cognitive/metacognitive engagement required in performing such tasks.

Emotional engagement refers to students' emotional reactions to academic subject areas or to school more generally (Pekrun and Linnenbrink-Garcia 2012). Motivational constructs such as perceptions of value related to school and interest are often included in operational definitions of emotional engagement. Specifically, interest, refers to the enjoyment that one feels when engaging in a task, and relative cost, the perceived negative aspects of engaging in a specific task are perhaps the most theoretically closely tied to emotional engagement; however, utility and attainment have also been shown as related to engagement.

Pekrun (2006) proposed a taxonomy that posited the existence of positive versus negative and activating versus deactivating academic emotions. Activating emotions are associated with emotional engagement and a positive relationship has been found between emotional engagement and achievement (Pekrun and Linnebrink-Garcia 2012). In contrast, deactivating emotions can cause a student to lose focus and disengage with the material or context. On the other hand, theoretically, both negative and positive emotions can facilitate activation of attention and engagement; however, research to date has shown an advantage for positive emotions over negative in promoting engagement (Broughton, Sinatra, and Nussbaum 2013).

Cognitive engagement refers to students' cognitive investment in learning, including mental efforts directed toward learning, use of self-regulated strategies to learn and master concepts, and willingness to exert necessary efforts for comprehension of complex ideas (Zimmerman 1990). Possibly, cognitive engagement is the most difficult to be precisely defined for many of the dimensions of cognitive engagement overlap with dimensions of both behavioral engagement and emotional engagement. This raises the issue of whether the dimensions can be effectively differentiated if there is so much overlap among them. In fact, each dimension of engagement includes motivational and/or self-regulatory constructs. The operational definition of cognitive engagement is sometimes overlapping or even conflated with existing motivation and self-regulation constructs.

Although this conventional framework has been widely used to describe engagement research (e.g., Galla et al. 2014; Wang and Eccles 2012), its generic form does not capture the complexity of today's engagement research agenda. In this sense, recently others have proposed additional dimensions of engagement. Linnenbrink-Garcia, Rogat, and Koskey (2011) expanded on this tripartite conceptualization of engagement to include a social-behavioral dimension of engagement, relating to students' affect and behavior during collaborative group work. Additionally, Reeve and Tseng (2011) proposed agentic engagement as an additional dimension to address how students proactively contribute to the instruction provided by teachers. More recently, Filsecker and Kerres (2014) suggested volitional engagement to theoretically justify engagement as "energy in action." Further research is necessary to determine to what extent these are unique dimensions of engagement.

In order to promote school engagement, we must first better understand whether various aspects of the school environment influence the behavioral, emotional, and cognitive engagement differentially and whether the associations between the school environment and engagement are mediated by more fundamental motivational beliefs within the student. Therefore, there is a critical need for research that takes an integrative motivational approach to investigate the contextual and psychological factors that predict school engagement (Fredricks, Blumenfeld, and Paris 2004).

Here, we will review different achievement motivation theoretical frameworks that allow us to explain active student involvement in learning tasks and differentiate a series of motivational variables commonly associated with student concentration, attention and effort -behavioral engagement-; the presence of task-facilitating emotions and/or the absence of task-with drawing emotions -emotional engagement- and usage of meaningful learning strategies -cognitive engagement-.

STUDENT ACHIEVEMENT MOTIVATION

Achievement motivation has been defined in various ways depending on theories and context (Murphy and Alexander 2000), but it usually refers to the desire to accomplish something of value or importance through one's own efforts and to meet standards of excellence in what one does. *Expectancy-value theory* provides a theoretical foundation for a mediational model that links school characteristics to school engagement and performance through student motivational beliefs. According to expectancy-value theory, achievement-related choices such as school engagement are influenced psychologically by the individual's expectation for success and subjective valuing of the academic work; students most likely to engage in school learning place higher value and have greater confidence in their academic abilities than those who do not.

Self-determination theorists and *stage-environment fit* theorists posit that engagement is manifested in the quality of students' interactions with learning activities and academic tasks and that 'fit' is optimized when the school context provides adequate support for the development and maintenance of a student's sense of competence, autonomy, and relatedness (Deci and Ryan 2000; Eccles 2004). Competence refers to the need for experiencing oneself as effective in one's interactions with the social environment (Elliot and Dweck 2005), and a student's need for competence is fulfilled when they know how to effectively achieve desired outcomes (Skinner and Belmont, 1993). Autonomy refers to the extent to which an individual experiences oneself as the source of action and it is supported when a student perceives schoolwork as relevant to their interests and goals or when a student experiences choice in determining their own behavior (Assor, Kaplan, and Roth 2002). Finally, relatedness refers to the need for experiencing oneself as connected to other people (Connell and Wellborn 1991) and it is likely to occur when teachers and peers create a caring and supportive environment.

Achievement goal theory (Ames 1992; Dweck and Legget 1988) posits that the purposes that students hold for engaging in a specific academic task are an important antecedent to their achievement-related processes and outcomes. Three types of achievement goals that have been commonly studied are mastery, performance-approach, and performance-avoidance (e.g., Elliot and Church 1997, Middleton and Midgley 1997, Skaalvik 1997) and accumulating evidence has shown that the adoption of these goals is driven by differential antecedents and affects cognitive, emotional and behavioral engagement (Elliot 1999).

The *control–value theory* of achievement emotions (Pekrun 2006) currently represents the most influential theory of students' emotions, and offers an integrative framework for analysing the antecedents and effects of emotions on learning and achievement. A basic proposition of the theory pertains to appraisal antecedents of the emotions and it is assumed that appraisals of ongoing achievement activities, and of their past and future outcomes, are of primary importance in this respect. Succintly stated, it is proposed that individuals experience specific achievement emotions when they feel in control or out of control of, achievement activities and outcomes that are subjectively important to them (Pekrum and Perry 2014). Emotions, their antecedents and their effects on student engagement and achievement are interconnected by reciprocal causation. Thus, emotions can affect various aspects of self-regulated learning, and vice versa: self-regulated learning can influence emotional experiences, either directly or indirectly, by shaping cognitive appraisals (Pekrun et al. 2002).

STUDENTS' SELF-BELIEFS

Self-beliefs include beliefs about one's perceived competence, self-efficacy, self-esteem and self-concept. Although these constructs are theoretically distinguishable they have not always been empirically differentiated. Self-concept concerns students' knowledge about themselves and how students define themselves, measures global perceptions of the self whereas self-esteem indicates overall evaluations of the self relate to the value students place on themselves; it is an evaluation of worth.

Perceived competence would be defined as the student's perception of current competence at a given activity (Wigfield and Eccles 2000), that is, how competent students currently believe they are in a particular area while self-efficacy, refers to the perceived ability of an individual to successfully perform certain tasks, it relates to beliefs about whether, and how well, students can complete a task, often in the future.

Self-efficacy would be a component of self-belief more task-, context-, and situation specific than self-concept (Pajares and Miller 1994). Self-concept represents an individual's evaluation of their current functioning or competence in general or in a specific domain (Bong and Skaalvik 2003; Marsh and Martin 2011). It is typically measured by asking individuals to indicate the extent to which they endorse statements as "*I am good at -a particular subject area-*." Thus, the conviction that one will be able to pass a test if one studies for it is a self-efficacy judgment, while the belief that one is not good at math is a self-concept judgment.

Self-efficacy and self-concept are not always clearly distinguished in the literature. Nonetheless, a comprehensive review by Bong and Skaalvik (2003) identified important differences between the constructs. These include the extent to which they are influenced by goals and designated standards, social norms, and/or internal comparisons; whether they are oriented to the future (i.e., what you believe you can achieve) or to the past (i.e., what you have actually achieved); and whether they are changeable or stable across time. In these terms, self-efficacy is argued to be heavily goal-referenced, somewhat normatively referenced, future-oriented and temporally changeable. By comparison, self-concept is both normatively and impassively referenced, past oriented and more stable across time.

In any case, most students hold beliefs about their own capabilities and competence in accomplishing academic tasks. We focuses on one of the most influential and widely studied type of self-beliefs, namely self-efficacy, that within the school context, refers to what individuals expect and believe they will be able to accomplish in academic tasks with whatever abilities and skills they may have (Bong and Skaalvik 2003; Schunk and Meece 2006). It is typically measured by asking individuals to judge how confident they are that they will be able to master their schoolwork or perform representative tasks.

Self-Efficacy Beliefs

Experiences with success or failure are associated with strong or weak feelings of self-efficacy. Through internal and external attributions of success and failure, self-efficacy has an influence on effort, the choices individuals make, the courses of action they pursue, and task persistence. Highly efficacious individuals seek out challenging opportunities. Conversely,

individuals with low efficacy may exclude options rapidly without attempting to examine the benefits or disadvantages of each possible course of action. Self-efficacy beliefs are one of the motivational factors most consistently linked to student behavioral engagement (Greene and Miller 1996; Meece, Blumenfedl and Hoyle 1988; Miller, Behrens, Greene and Newman 1993; Pintrich and Garcia 1991).

Regarding the motivational student engagement, Bandura's Social Cognitive Theory (1997) posits that self-efficacy beliefs are influential in all aspects of goal achievement from the formation of intentions and aspirations to the execution of behaviors required to achieve those goals. An iterative process exists in which goals are established, success or failure measured, self-beliefs adjusted, and new goals and intentions are established. As a result, self-efficacy beliefs, besides influence behavioral engagement, are hypothesized to both influence and affect motivational processes in academic environments (Pintrich and Schunk 2002).

On the other hand, it is the component of self-beliefs that appears to be critically linked to academic performance (Chemers, Hu and Garcia 2001; Valentine, DuBois and Cooper 2004, Zajacova, Lynch and Espenshade 2005). In several meta-analyses, self-efficacy has emerged as a robust predictor of performance across time, a variety of environments, and different populations (Bandura and Locke 2003). Multon, Brown, and Lent (1991), for example, established that across students of varying ages and studies of different designs, academic self-efficacy beliefs accounted for 14% of variance in student academic performance.

Although self-efficacy beliefs stem principally from mastery experiences because success serves as an authentic barometer of capability and builds a robust sense of efficacy (Palmer 2006); vicarious experiences in which individuals compare themselves to others, verbal/social persuasions which convey confidence from others, and physiological and affective states which control emotions can all alter self-efficacy beliefs. In sum, individuals use experiences and persuasions to interpret and internalize their successes and failures which, in turn, inform subsequent motivations and performance (Pajares 1996, 2003).

SUBJECTIVE VALUING OF ACADEMIC WORK

Subjective task value is a construct composed of beliefs regarding how enjoyable a task will be, how useful a task is for fulfilling short- and long-term goals, and how well a task meets personal needs and assists the realization of personal identities (Eccles and Wigfield 2002). Several studies have shown that students' perceptions of their school environment predict the value that students attach to school. Student subjective task valuing of learning is enhanced when the school environment provides clarity of expectation, consistency and predictability of response, emotional and autonomy support, opportunity to learn and master meaningful material, and sufficient or appropriate instrumental help, support of students' personal goals and interests (Assor et al., 2002; Wang and Eccles 2013). On the other hand, there is strong evidence that students who place high subjective task value on academic work are more likely to select and participate in the task (Deci and Ryan 2000) and report also higher levels of cognitive and emotional engagement (Katz and Assor 2006).

Enjoy the Learning Task: Individual and Situational Interest

Many parents and teachers explain children's lack of motivation in school as due to a lack of interest and students often say they don't learn because school and classes are boring. These intuitive views of motivation usually propose interest as an important aspect of motivation that usually influence on student engagement. In this context, the construct of interest is similar to the construct that Eccles and Wigfield have called intrinsic value, the enjoyment one gains from doing the task (Wigfield and Eccles 1992). When individuals do tasks that are intrinsically valued, there are important psychological consequences for them, most of which are quite positive (see Deci and Ryan 1985).

Research on interest, broadly defined, has waxed and waned over years and has been pursued by researchers from a number of different perspectives, beyond specific expectancy-value models. Empirical studies of interest began roughly 20 years ago, although theoretical discussions date back much further, beginning with Dewey's (1913) classic work entitled *Interest and effort in education*. A good number of empirical studies, review articles and books in the 1990s address a wide variety of variables related to interest and learning. Specifically, the differentiation between personal interest as an individual disposition, the interest of context or situation and interest as a psychological state including situational interest made by Krapp, Hidi and Renninger (1992) can help us understand this diverse body of research. There is a general agreement in the literature on interest that the two factors, person and situation, work together and explain students' experience of situational interest (Renninger and Hidi 2011).

Interest or intrinsic value is also similar to intrinsic motivation construct as defined by Deci and his colleagues (Deci and Ryan 1985; Deci, Vallerand, Pelletier, and Ryan 1991) and by Harter (1981) because it concerns doing a task out of interest and enjoyment. Interest and intrinsic motivation have been studied in parallel by different theorists in different research contexts. Personal or individual interest may be confused with intrinsic motivation, but there is a conceptual and cause-effect distinction between these two concepts. On the one hand, although intrinsic motivation is typically defined as the motivation to engage in activities for their own sake, it is often characterized in terms of both experiential (focused task engagement, involvement, and the experience of enjoyment, interest, and excitement) and dispositional (the desire to continue engaging in those activities) components. This definition of intrinsic motivation appears to incorporate both individual and situational interest, and, in this sense it is easy to understand that some researchers use the terms interest and intrinsic motivation almost interchangeably. On the other hand, Schiefele (1999) argued that individual interest is an antecedent to cognitions that determine the strength of an individual's intrinsic or extrinsic motivation to act in a particular situation. Thus, individual interest is viewed as a pre-condition of intrinsic motivation. Although seems very questionable whether the early triggering stages of situational interest may precede the development of intrinsic motivation, individual interest may be the closest precursor or a primary source of student intrinsic motivation (Urdan and Turner 2005).

Even though interest-based actions are often associated with positive emotional experiences, and even though some researchers have considered interest to be synonymous with enjoyment and liking, considerable theoretical and empirical work suggest that situational interest does not necessarily have such associations. Only when situational interest is maintained or "held" it necessarily corresponds to an intrinsically motivated state in which

positive emotions such as enjoyment and liking are experienced. A student who finds maths more interesting as a result of an exciting documentary might choose to read maths books in their free time or decide to take more maths courses; but only those students whose interests last beyond the exciting lecture would be considered intrinsically motivated. Moreover, these students' interests would now be considered more dispositional and stable, and we would expect their interest to be accompanied by increased knowledge and value of maths.

Individual interest, also referred to as personal or topic interest, refers to a continually evolving relation of a person and particular subject content (Krapp and Fink 1992; Krapp, Hidi and Renninger 1992). The basis of personal interest appears to be pre-existing knowledge, personal experiences and emotions (Deci 1992; Renninger 1992; Schiefele 1991; Tobias 1994). Unlike the momentary or specific situation of a situational interest, which triggers attention but may or may not hold over time, individual interest is characterized by the likelihood of re-engagement with specific classes of subject content. Investigations focusing on individual interest have shown that children as well as adults, who are interested in particular activities or topics pay closer attention, persist for longer periods of time, learn more and enjoy their involvement to a greater degree than individuals without such interest.

Situational interest refers to information that is of temporary value, enviromentally activated and context-specific (Hiddi and Anderson, 1992) captures this desire to engage in activities in the moment, and is characterized by heightened attention, intensified emotional experience (often positive), and perceived meaning (Chen, Darst, and Pangrazi 2001; Linnenbrink- Garcia, Durik, Conley, Barron, Tauer and Karabenick 2010; Schraw and Lehman 2001). Early research on situational interest focused on the sources of situational interest, such as novelty, violence and uncertainty, and on the cognitive outcomes of interest, for instance, narrowing inferences, integrating information with prior knowledge, and focusing attention. Many subsequent investigations have centered on a subclass of situational interest, referred to as text-based.

Text-based factors refer to properties of to-be-learned information, typically a text, that affect interest. Research investigating text-based factors, refer to properties of to-be-learned information that affect interest, has focused on three subcategories including seductiveness -highly interesting but unimportant-, vividness -create suspense, surprise or are otherwise engaging-, and the coherence of text segments -factors that affect the reader's ability to organize the main ideas in a text-. A review on situational interest carried on by Schraw and Lehman in 2001, referred the distinction among text-, task- and knowledge-based interest.

Situational interest may have an important application in the classroom in order to promote the student motivation by the individualization of interests. Even though interest has been recognized as an important condition for cognitive engagement, educators continue to wrestle with the difficulties of working with academically unmotivated students (Hidi and Harackiewicz 2000). Most teachers would agree that individualization is important and ongoing in their classrooms but meeting individual needs in this way is an extremely time and effort consuming task for them. An alternative to the individualization of interests might be provided by situational interest attending the proposal of Hidi and Renninger (2006). Authors propose a four-phase model of interest development and suggest its potential for supporting educational intervention. The first phase of interest development is a *triggered situational interest*. If sustained, this first phase evolves into the second phase, a *maintained situational interest*. The third phase, which is characterized by an emerging or *less developed individual interest*, may develop out of the second phase. The third phase of interest development can

then lead to the fourth phase, a *well-developed individual interest*. When teaching students who do not have a sustained personal interest in the content, the teacher should start the learning process by creating situational interest to elevate the students' motivation to engage them in learning (Durik and Harackiewicz 2007).

Although individual interest is triggered by an individual's predisposition and situational interest by environmental factors, it must be emphasized that the two types of interest are no dichotomous phenomena that occur in isolation. On the contrary, each can be expected to influence the other's development. Situational interest, which can only result from an interaction between the person and the environment, may, in turn, contribute to the development of a long-lasting individual interest. In this context situational interest could be a teacher-friendly construct as it is induced by a particular situation that can be planned, created, and manipulated by the teacher.

Task Utility Value

When student taking a geography class to fulfill a requirement for a history degree, it does because that task is useful, it fits into an individual's future plans. Utility value or usefulness refers to how useful is the academic task for fulfilling short- and long-term goals (Eccles and Wigfield 2002). Utility value is similar to extrinsic motivation in certain aspects because when individuals engage in an activity based on its utility value, the activity is a means to an end, rather than an end itself (Wigfield, Tonks and Klauda 2009) capturing thus more "extrinsic" reasons for engaging in a task; doing a task not for its own sake but to reach some desired end state. Although there potentially is some overlap in the constructs of utility value and extrinsic motivation, it is important to point out that these come from distinct theoretical perspectives and so have different intellectual roots.

Even though utility value is positively correlated with measures of interest and personal choices, utility value has been described as having certain extrinsic qualities because the value emerges from a task's association with other pursuits rather than from direct experience with the task itself (Eccles and Wigfield 2002). The extent to which student perceive current task performance as instrumental to achiveming personally valued future goals, that is, student perceived instrumentally, influence on cognitive engagement (Husman and Lens, 1999; Miller and Brickman 2004). The model of Miller and Brickman (2004) explained that perceiving current tasks as instrumental has two benefits for academic engagement: it transmits the incentive value of the future goal to the current task and it influences the achievement goals student adopt. The extrinsic aspects of utility value are linked to personally held goals (Eccles and Wigfield 2002) and to be a significant predictor of both self-regulation and meaningful strategy use, -even when controlling for the influences of mastery goals and perceived ability (Miller, DeBacker and Greene 1999).

This direct link on self-regulation could be a potential for supporting educational intervention, students might be more receptive to utility value interventions because of the extrinsic nature of utility value, and as they come to appreciate a task's utility value, they may become more engaged and develop more interest in the task. Specifically, students with low task interest may be more open to an intervention suggesting that a task could be useful than that it is fun because the utility value might match their personal goals without blatantly

contradicting their task experience. Interventions directly targeting intrinsic task value may have an ironic effect of undermining a sense of autonomy (Deci and Ryan 1985).

STUDENTS' PURPOSES FOR ENGAGEMENT IN LEARNING

For decades, research have proposed achievement goal orientation frameworks to explain the differences in individuals' purposes for engagement in learning and their relationships with student outcome variables in various learning contexts (Ames, 1992; Dweck and Leggett 1988; Elliot and Church 1997; Pintrich 2000). Initial conceptual work on achievement goals emerged in the late 1970s and early 1980s, and distinguished between two different goal constructs: mastery goals and performance goals (see Ames 1992, for an overview of the different labels used for these goals). Mastery goals were construed in terms of striving to develop competence through task mastery and improvement, whereas performance goals were construed in terms of striving to demonstrate competence relative to others. This is commonly referred to as the dichotomous model of achievement goals.

Achievement goal theory predicts that the purposes students have for engaging in achievement tasks will influence their level of cognitive engagement and research demonstrates that students whose purpose is to improve their competence, adopting learning, mastery or task goals use meaningful processing strategies and self-regulation strategies to a greater extent than those students whose purpose is to demonstrate competence, adopting performance or ego goals (Greene and Miller 1996; Meece, Blumenfeld and Hoyle 1988; Miller, Behrens, Greene, and Newman 1996; Pintrich and Garcia 1991). From this framework, some studies showed that performance- approach goals are positively related to cognitive engagement (Pintrich, 2000) and other studies showed that they are unrelated (Middleton and Midgley 1997). Researchers have suggested that self-perceptions may play a moderating influence, such that for students with positive self-perceptions performance-approach goals may not be that detrimental and for students with negative self-perceptions, performance- approach goals would be especially maladaptive (Harackiewicz et al. 2002).

In the mid 1990s, proposed that the performance goal construct of the dichotomous model be bifurcated with respect to the theoretically rich, historically-grounded approach-avoidance distinction. The result was the trichinous model of achievement goals, comprised of mastery goals -comparable to those from the dichotomous model-, performance-approach goals (focused on doing well relative to others), and performance-avoidance goals (focused on not doing poorly relative to others). From this framework, in terms of cognitive engagement, several studies have confirmed that mastery-approach goals are consistently related to cognitive engagement -use of deeper-level meaning-oriented strategies- (Elliot and McGregor 2001; Senko and Miles 2008; Wolters 2004). Besides the effects of performance-approach goals on cognitive engagement remain more ambiguous, a clearer and more consistent pattern emerged for studies that have separated approach and avoidance goals.

Late nineties, Elliot (1999) and Pintrich (2000) proposed that mastery-based goals, like performance-based goals, could be bifurcated with regard to the approach-avoidance distinction. This yielded a fourth goal construct, a mastery-avoidance goal, focused on not doing poorly relative to task demands or one's own performance trajectory. This goal allowed a full crossing of the definition (mastery/performance) and valence (positive/negative)

components of competence, giving rise to the 2 × 2 achievement goal model. Recently, Elliot, Murayama, and Pekrun (2011) interestingly extended the 2 × 2 achievement goal model to a 3 × 2 model by separating mastery-based goals into task-based and self-based categories. Task-based goals focus on how one is doing relative to the absolute demands of the task or activity –degree has or has not accomplished the activity whereas self-based goals focus on how one is doing relative to one's own trajectory - degree is or is not improving-. Performance-based goals are simply relabeled other-based goals in this model to more clearly link these goals to their standard used to define competence. Definition of competence (task/self/other) is then fully crossed with valence of competence (positive/negative) to produce the six goals of the 3 × 2 model: task-approach (attaining task-based competence), task-avoidance (avoiding task-based incompetence), self-approach (self-based competence), self-avoidance (self-based incompetence); other-approach (attaining other-based competence), and other-avoidance (avoiding other-based incompetence).

Students Pursuing Multiple Goals in the Classroom

The bulk of the studies done within this paradigm has looked at how these goals are related to various indicators of school engagement. In recent decades, researchers have contemplated the possibility of goals, traditionally considered exclusive, having complementary and differential impact on students' behavioral and cognitive engagement (Darnon et al. 2010; Ng 2008; Núñez et al. 2011). Researchers have further postulated that it is possible for students to pursue mastery and performance goals at the same time using one or the other depending on their personal characteristics, the nature of the assigned task and situational or contextual variables, thereby attaining higher levels of motivation, self-regulation of learning and academic achievement (e.g., Bouffard et al. 1995; Harackiewicz et al. 2000).

These positive and complementary results have led to the consideration that both types of goals may have beneficial effects in academic contexts. Consequently, the multiple goals perspective has become a motivational alternative with great theoretical and applied benefits. Thus, in a longitudinal study carried out with secondary students, Pintrich (2000) concludes that students who are concerned about their performance and about performing better than their classmates, but who are simultaneously oriented towards learning, follow a parallel trajectory to that of students who are only oriented towards learning. However, Pintrich also notes that this trajectory is not equally adaptive in the case of students only concerned with performance. Thus, simultaneously choosing different goals in authentic school environments is an option that normally carries most of the benefits at an academic level (Rodríguez et al. 2001; Valle et al. 2003, 2009).

Drawing from a sample of middle school math students, Conley (2012) yielded seven distinct patterns or profiles of motivation. These profiles included (a) a cluster of students who approached math strictly with mastery-oriented achievement goals, (b) five clusters of students whose math-focused motivations were characterized by mixtures of mastery and performance goals, and (c) a student cluster characterized by comparatively lower levels of both kinds of achievement motivation. Importantly, these same analyses showed that students' perceptions of task value contributed to the classification of different motivational patterns. In addition to describing differences in students' motivational patterns, authors have

examined the relationship between students' motivations and their performance and concluded that the influence of motivation on academic achievement varied among different profile groups.

In higher education, from this multiple goals perspective research obtained evidence of four distinct profiles resulting from the combination of mastery and performance goals which were differentially associated with cognitive, emotional and behavioral engagement (Daniels et al., 2008; Valle et al., 2003). Pastor et al. (2007), using a type of person-centered statistical method called latent profile analysis to explore the heterogeneity of students' achievement motivation among college, supported six distinct patterns or profiles of achievement motivation. These profiles included students who adopted the full range of achievement goals (i.e., mastery approach/avoidant and performance approach/avoidant), students who adopted various degrees of mastery and performance approach goals as well as students who adopted both mastery approach and avoidance goals. Including performance-avoidance goals, Valle et al. (2010) also identified six motivational profiles, and concluded that higher levels of mastery goal within the motivational profile seem to be a powerful protective factor in maintaining students' high interest in academic tasks, high beliefs control and high perceived efficacy.

STUDENT'S ENJOYMENT: THE ROLE OF ACADEMIC EMOTIONS ON STUDENT ENGAGEMENT

Students experience a wide variety of emotions when attending class, doing homework and taking exams: enjoyment, hope, anger, boredom and so on. The diverse range of academic emotions impact on learning in different ways. Pleasant activating emotions such as enjoyment generally leads to high engagement and attention, have a positive impact on motivation and performance, while pleasant deactivating emotions such as relief and relaxation have a potentially negative effect, can cause a student to lose focus and disengage with the material or context (Linnenbrink 2007). Until recently, these emotions did not receive much attention by researchers with, probably two exceptions, studies on test anxiety in the 1930s and research on causal attributions as antecedents of achievement emotions. During the past 10 years, however, affect and emotions begin to be recognized as critical importance variables for students' engagement.

The control-value theory of achievement emotions posits that achievement emotions are a multiplicative function of the students' subjective perception of control over learning task and outcomes and subjective perception of the value of these learning task and outcomes (Pekrun 2006). Research generally confirm that positive emotions are positively associated with perceptions of control and value, while negative emotions are negatively correlated with these perceptions (Frenzel, Pekrun and Goetz 2007; Goetz, Pekrun, Hall and Haag 2006; Pekrun et al. 2002, 2004, 2010) and that subjective value moderates the effects of perceived control on emotions, that is, if no value is perceived, no emotion is instigated (Pekrun, Frenzel, Goetz, and Perry 2007).

Achievement emotions are defined as affective arousal that is tied directly to achievement activities or outcomes through a number of cognitive, motivational and regulatory mechanisms and these emotions affect students' engagement and performance (Efklides and

Volet 2005; Linnenbrink-Garcia and Pekrun 2011). Pekrun and Linnenbrink-Garcia (2012) suggest that engagement mediates the relationship between emotions and learning and summarizes the ways in which emotions affect learning, through attention, memory, motivation, and self-regulation. A large amount of cross-sectional and longitudinal research has shown also that emotions contribute significantly to the prediction of academic achievement (Pekrun et al. 2002, 2004).

Control-value theory of achievement emotions proposes that value is one of the key predictors of enjoyment and predicts that learning situations with high personal value will be positively related to students' experience of enjoyment in achievement contexts. In this framework, enjoyment is classified as a positive, activating, activity focus emotion and involves thoughts and cognitions concerning the process of working on an achievement activity. In this line, recent writings from the positive psychology group (e.g., Fredrickson 2001 or Seligman and Csikszentmihalyi 2000) have focused attention on the role of positive emotions in human behavior and from this perspective relations between enjoyment and interest were also explored.

Whereas negative emotions narrow the individual's focus in preparation for defensive action, the function of positive emotions is more likely to be one of expanding an individual's focus and refers to the function of positive emotion as "broaden-and-build" (Fredrickson 2001). Fredrickson uses the term joy rather than enjoyment and suggests that emotions such as joy and interest have complementary effects, the playfulness of the emotion joy combines with the exploratory and information seeking of the emotion interest. The combination of joy and interest can be expected to be associated in achievement settings with high levels of task engagement. Students who experience joy and interest while working in the classroom are engaged with the topic content and are likely to express a desire to continue their engagement with the topic.

In this context, the student enjoyment and capability of sustaining academic engagement will depend on the goal orientation and learning content. A theoretical model that links the goals to various discrete achievement emotions has been developed. Mastery goals focused on the controllability and positive value of achievement activities could foster enjoyment -and reduce boredom and anger-. Performance-approach goals focused on the controllability of success outcomes and their positive value should promote positive outcome emotions as pride. Performance-avoidance goals focused on the uncontrollability of these outcomes, and their negative value promote anxiety and shame. Recent findings from the intraindividual and interindividual analysis directly support the propositions (Goetz, Sticca, Pekrun, Murayama and Elliot 2016).

CONCLUSION

Although most research conceptualizes engagement as a multi-dimensional construct consisting of cognitive, affective, and behavioral dimensions, most quantitative studies referred to herein employ only one such dimension in their analytic models. In this point, Crick (2012, 676-678) and others (e.g., Fredricks, Blumenfeld and Paris 2004, 83) have recommended research that better integrates the cognitive and emotional dimensions of student engagement.

On the other hand, majority of research observed here has been based on variable-oriented techniques that examine overall relations between engagement, predictors, and outcome variables. This analytic technique provides insights into relations for "average" students across an "average set of features," but can conceal relations for different subpopulations of students. To date, the possibilities associated with person-centered statistical methodologies have largely remained untapped in student engagement research, with the notable exception of research on multiple goals to which we referred a few lines ago. Person-centered methods are important for engagement research because they enable researchers to analyze relations among multiple variables and constructs in one measurement model (Janosz, Archambault, Morizot, and Pagani, 2008, 22-23). Moreover, whereas conventional variable-centered approaches assume that relations among variables are constant for the entire population, person-centered approaches model population heterogeneity in the joint distribution of variables, eschewing a "one size fits all" specification (Nylund, Bellmore, Nishina, and Graham 2007, 1708). This unique analytic feature enables researchers to explore how multiple engagement-related concepts and constructs might uniquely correlate or "hang together" for some populations of students while remaining disconnected elements for others (Eccles andWang 2012).

Person-oriented techniques can be used to describe patterns of individuals' engagement within and across time, which is critical for research, practice, and policy with discrete subpopulations of students (Eccles and Wang, 2012). In fact, although most theories assume a reciprocal relation between context and engagement, our current understanding is largely based on cross-sectional and short-term longitudinal studies that have investigated unilateral influences (Fredricks 2015, 32). This research tends to be interpreted as context influencing engagement, neglecting the fact that adults and peers also respond differently to children depending on their level of engagement and disruptive behavior (Kindermann 2007; Skinner and Pitzer 2012). Authors have recommended development person-centered statistical modeling as a method for better new holistic integration of cognitive and emotional dimensions of student engagement (Feinstein and Peck 2008, 17-18).

It also seems essential to begin designing research that allows us to study academic engagement as a developmental phenomenon requiring longitudinal research. From an evolutionary perspective, how might students' early school experiences affect to their academic engagement? Possibly, students who succeed early in school develop positive self-perceptions that help them identify themselves with school and so, the more students identify with school, the more they participate in school activities. Over time, this sense of school identification interacts with student behaviors as well as the social environment. These interactions facilitate the development of desirable short and long term educational outcome trajectories (Finn and Zimmer 2012), trajectories for which engagement is a key driver. In contrast, what about the students who do not experience early school success? What is the qualitatively different set of educational trajectories and outcomes? Although early school success helps students identify with school, early school difficulties contribute to a cumulative cycle of student frustration, low self-esteem, and eventually behavioral withdrawal. Over time, these corrosive dynamics weaken students' school attachments and identification, erode their affiliations with pro-social peers (Ream and Rumberger 2008), and eventually reduce their chances of completing high school (Alexander, Entwisle, and Horsey 1997).

Over the past two decades, there has been an explosion of research on student engagement because of its potential in addressing persistent educational problems such as low achievement, high dropout rates, and high rates of student boredom and alienation (Fredricks 2015). Nevertheless, in most studies, engagement and disengagement are viewed and measured on a single continuum, with lower levels of engagement indicating disengagement. We consider relevant to develop alternative theoretical frameworks to explain how and why students do not engage academically because engagement and disengagement are separate and distinct constructs associated with different learning outcomes. The most preceding theories help describe only how activity participation may give rise to different types of motivations and dispositions, but in our opinion, additional constructs are needed to help describe why students may choose to disengage from school and related activities. Theoretically, for example, student experiences of disidentification can either be task specific or global. That is, student disidentification may be considered task-specific when students disidentify with one aspect of schooling but not others. Or, student disidentification may be considered more global, such as when students feel consistently alienated by the people or practices in school (Taines 2012). In this line, psychometric work suggests that the positive and negative features of emotional engagement are both consequential and structurally distinguishable and differential associations among engagement and disaffection. Disengagement should not be considered to solely reflect the absence of engagement, but to be understood as a separate and distinct psychological process that makes unique contributions to student outcomes in school settings.

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Chapter 2

ENGAGEMENT: A NEW PERSPECTIVE FOR REDUCING DROPOUT THROUGH SELF-REGULATION

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ABSTRACT

Over the last three decades, a new research perspective in the field of educational psychology has emerged: the theoretical model of engagement, a multidimensional construct which basically collects indicators at the cognitive, emotional, and behavioral levels. The developments in implementation and measurement of this construct have allowed for a greater understanding of the factors affecting school performance and achievement. More specifically, this model has frequently been used in order to analyze school dropout, which remains one of the most worrying concerns at an international level, from a systemic perspective. From this point of view, it is understood that academic performance may be explained as much by the social and academic contexts where the teaching-learning process is developed (family, peer groups, and school) as it can by the individual's internal processes (cognitive and emotional), which in turn influence both academic and behavioral components. This chapter contains the conclusions from several research studies which further delved into the theoretical and applied construct of engagement. Likewise, it highlights the close link between this concept and that of self-regulated learning, which suggests that students should be able to think about their own learning process and regulate it through different strategies that would allow them to do classwork and homework with greater efficiency. Therefore, it is important to compare both of these conceptual frameworks in order to get a greater understanding of the aspects that must be considered in order to get students involved and engaged in the educational system.

Keywords: engagement, school dropout, achievement, self-regulated learning

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INTRODUCTION

Dropout among students at different education levels is an overall problem with important implications for many countries and educational institutions. The theoretical model of engagement has emerged over the last decades as a potential new perspective to analyze it, while simultaneously integrating the main aspects that create pathways leading to greater academic achievement, and building up hence a more comprehensive overview of the factors affecting the linkage process with educational institutions.

In order to understand this model and the development it has recently experienced, this chapter will first analyze the dropout phenomenon, contextualizing it as an important issue at educational and political levels with adverse implications at both individual and social levels; and provide examples of its use in order to better understand it according to its different areas and variables.

Next, the focus will shift to the emergence of the "engagement" construct as a reference framework aiming to overcome the constraints of studies on dropout by providing a more comprehensive perspective that considers the educational process as a whole rather than as a partial solution for individual deficiencies. In this context, the engagement construct will be defined by mentioning the main proposed models and describing the current state of their use.

Later, the influence which the emergence of the engagement construct has had on encouraging academic achievement pathways and enhancing the main research lines in this field will be highlighted.

Finally, the relation existing between the engagement construct and self-regulated learning will be considered, by defining this latter concept, analyzing both the similarities and differences between them, and discussing their future prospects according to leading researchers in the field.

DROPOUT: A COMPLEX AND MULTICAUSAL ISSUE

Currently, school dropout is an issue leading to high individual and social costs, and hence there has been an increasing interest in its study among the researchers a variety of different educational levels. This phenomenon has been internationally defined in various ways, showing significant differences from one country to another in both the use of associated terms —(*early*) *school dropout*, (*early*) *school leaving*, *non-completion*, etc.— and using a great diversity of inclusion criteria, including different age ranges and diverse situations such as: discontinuation of studies at the primary stage, secondary stage, or college stage; not gaining an official qualification to attend higher education; changing courses or institutions in their college life, etc. This conceptual multiplicity makes the collection and comparison of data more difficult, and complicates the homogenizing of criteria in order to implement specific prevention measures and policies (European Commission 2014; Jugović and Doolan 2013).

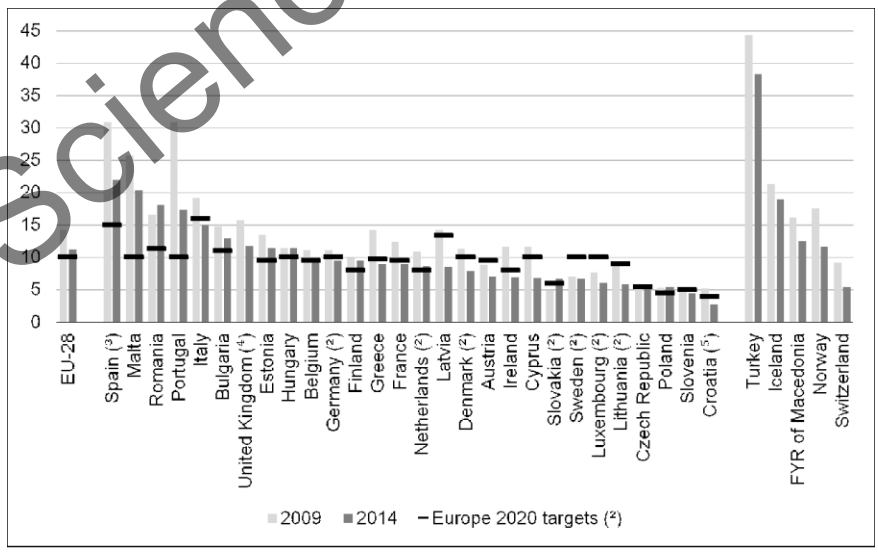
The concern about the phenomenon of school dropout is such that, in the framework of Horizon 2020, a goal of reducing dropout rates to 10% has been set at the European level for most member countries, which has yet to be achieved despite a number of measures that have been taken over the last five years (see Figure 1). Therefore, the definition of *dropout* used for

the present study —being one of the most widely accepted— refers to the percentage of people between the ages of 18 and 24 with a maximum educational attainment level of compulsory secondary education (European Commission 2014), which would be the equivalent to levels 0, 1 or 2 of the International Standard Classification of Education (ISCED) (Instituto Nacional de Evaluación Educativa 2014).

As far as the college stage is concerned, the current dropout rates are not a cause for optimism either. Within the member countries of the Organization for Economic Co-operation and Development (OECD), the average dropout rate at the university level stands at around 30% (OECD 2013a); however, there is much variability within the data: rates are lower in countries like Japan, Australia or Denmark (all below 20%), and greater in countries like the United States or Sweden (around 50%).

In any case, from an overall perspective, according to the data from the European Commission (2014), the current dropout phenomenon generates a number of questions that need to be addressed. However, as it is an issue where multiple factors of a personal, familial, educational, and social nature interact to influence the final decision to leaving studies early, answering these questions is not any easy task (see Figure 2).

One critical aspect is the fact that the decision to drop out is not a sudden decision but rather a result of a progressive process of decoupling or disengaging from the educational system, often beginning at as early as the Primary or Elementary Education levels (Rumberger and Lim 2008). Different types of variables often influence this process, from more personal ones like motivation, psychological characteristics or learning strategies (Bethencourt et al. 2008) to social variables, the most important of which include socioeconomic status and parental educational attainment levels. A number of others factors have less impact, such as gender, belonging to an ethnic minority, or having migrant background. It is important to highlight that none of these variables alone would be determining in explaining the discontinuation of studies (European Commission 2014), but rather there would most likely be an interaction between all of them.



Source: Eurostat (t2020_40). Data extracted in December, 2015.

Figure 1. Early leavers from education and training, 2009 and 2014.

Source: Own elaboration based on European Commission (2014), Council of the European Union (2015), and Fernández and Calero (2014).

Figure 2. Factors leading to school dropout, and the impact that the decision to leave studies has on the individual and on society.

Finally, it is important to take into consideration a number of additional institutional variables, which have been identified and reviewed by their negative impact on the phenomenon of dropout, such as non-inclusive educational practices including; those that do not consider student diversity or the needs shown throughout their educational pathways — including deficient and poor vocational guidance and the difficulties associated with the transition between educational stages—, the presence of a negative social climate, the absence of teaching methods and adequate curricula, and a lack of alternative ways for students to re-engage in the educational system (European Commission 2014).

These aforementioned associated variables and phenomena play a critical role in the process which results in students disengaging from the educational system and dropping out. This is extremely important since dropout rates are considered to be a quality indicator among educational institutions (Álvarez, Figuera and Torrado 2011) and may, in turn, generate crucial negative impacts affecting both the individual and the society.

Regarding the impact on the personal context, it is important to note that a dropout situation results in fewer employment opportunities and lower wages, and also increases the

likelihood of having future legal (Rumberger and Rotermund 2012) or family issues. Furthermore, more subjective effects must not be ignored, since they could lead to feelings of failure or increased anxiety, with consequences at the psychological level, e.g., loss of self-esteem (Loizos, Martínez and Álvarez 2012; Martínez and Álvarez 2005).

Moreover, beyond the personal and family context, there are also significant implications to the social context, which ultimately affect the economic prospects of the respective countries as well. Bearing in mind that we live in the so-called "knowledge society," the chances of a country prospering economically are closely associated with the level of training of its population, who must have the required knowledge in order to help their nation to be at the forefront of innovation, development, and research. If the general population has a lower educational level, their contributions will be restricted to the performance of low-skilled jobs, and its workers will have fewer opportunities to work in multinational or other corporations, which prefer to invest instead in cheaper workforces that underdeveloped or developing countries generally provide. Thus, besides tending to perpetuate the vicious cycle of transmission of poverty and social exclusion within their immediate environment, they would have to face unemployment more often, which requires a greater public expenditure on welfare benefits and increases the costs of public services, which can ultimately slow economic growth and reduce levels of social protection (Rumberger and Rotermund 2012).

Finally, in view of the crucial importance of the dropout phenomenon and its implications on a variety of economic and social factors at both a personal and political level, many supranational organisms have tried to intervene in order to promote research in a number of countries under the European guidelines. These measures have been designed to be implemented at three different levels: prevention, intervention, and compensation (European Commission 2014).

Firstly, at the prevention level, measures have been introduced to work on reducing specific aspects that would increase an individual's probability of dropping out. These include increasing learning pathway flexibility, developing vocational training and after-school activities, facilitating access to preschool, implementing positive-discrimination measures and desegregation policies, and decreasing grade repetition rates which increase the possibility of disengagement.

Secondly, different intervention measures have been developed which focus on identifying high-risk dropout groups, addressing absenteeism, providing specific educational support for teachers and specific students —those with a migrant background, poor academic performance, etc.—, and encouraging collaboration between the different agents who have influence on the individual's educational process, like the parents.

Lastly, compensation measures have been proposed in order to re-engage those students who have left their studies early, and to provide them with a second opportunity to obtain a quality education.

Therefore, it is important to underline the importance of both counseling and having access to vocational training in the prevention of school dropout, as well as the need to encourage inter-institutional collaboration at local, national, and international levels.

Moreover, after analyzing the different measures already mentioned, it is clear that all of them must be addressed in order to improve the deficiencies in the personal, institutional, and social contexts; as these areas have been also used in order to determine the variables leading to higher drop out rates.

This chapter will be focused on the personal —or student-related variables — that affect dropout from the comprehensive theoretical and explanatory framework of engagement.

THE EMERGENCE OF METACONSTRUCT "ENGAGEMENT"

The dropout phenomenon has long since been addressed from a perspective aiming to determine which variables of the personal, institutional or social contexts are most influential in the process of detachment and the final decision to leave studies. In this regard, authors like Bethencourt et al. (2008) claim that, in the college context, student related variables have a greater impact on the final decision to drop out than those associated with the academic context. Likewise, variables like previous academic performance, first year performance, student dedication, attendance or the relationship with teachers have also been identified as being particularly important for prediction purposes (Bernardo et al. 2015; Esteban, Bernardo, and Rodríguez-Muñiz 2015).

By studying mainly the variables associated with the students, the early research did not take into account the educational process comprehensively enough, and only focused on the student characteristics leading to drop out. Thus, while it enhanced research at organizational and taxonomic level, it complicated the general situation by using a variety of different theoretical models — psychological, sociological, economic, organizational, and the more developed interactionist— as a starting point, and in doing so provided only a partial vision of the dropout phenomenon (Tinto 1993).

These latter models are the reason why the need to overcome the constraints of focusing exclusively on a single context or dimension became clear, and there was a concerted effort made to try to develop models that included multiple contexts and dimensions. In this regard, during the late 1980s and the early 1990s, a brand new theoretical model emerged, which adopted a wider positive approach in order to overcome the aforementioned problems, and has since become increasingly more significant over the last twenty-five years: the model of engagement (Christenson, Reschly, and Wylie 2012).

The engagement model was applied to the academic context by using the study of Schaufeli et al. (2002) as one of its main references, which had studied the concept of burnout outside the occupational context, and defined its dimensions in reference to the educational process by using the Maslach Burnout Inventory-Student Survey. This study, through empirical research, demonstrated how students could suffer from emotional exhaustion, depersonalization, and a lack of efficacy or feelings of incompetence regarding their academic performance, similar to those of workers suffering from burnout in their work environment; this situation leads, in many cases, to the consideration and even the decision to leave studies.

Although there is a wide conceptual diversity in defining this theory, one of the most successful definitions was suggested by Fredricks, Blumenfeld, and Paris (2004), who suggest that engagement includes all student cognitions, emotions, and behaviors concerning their learning process and their experience within the school as a whole.

Christenson et al. (2012, 816-17) later weigh in on the matter and ultimately conclude that engagement: is a multidimensional construct made up of a cognitive, emotional, and behavioral dimension (including the academic one); requires effort and energy; boosts the

learning process, which is affected by several contextual influences; can be achieved by all students; refers to the active involvement in academic and non-academic activities in the school context; and is focused on the commitment to achieving the goal of significant learning due to its perceived importance for their future.

More recently, and within this same line, it has also begun to be studied as a multidimensional construct focused on the identification of variables which could help to prevent school dropout and enhance academic achievement pathways. This construct has been considered as useful in order to explain the progressive decoupling process that eventually leads students to discontinue their studies (Appleton, Christenson and Furlong 2008; Archambault et al. 2009a; Chase et al. 2014; Reschly and Christenson 2012; Rumberger and Lim 2008; Tarabini et al. 2015). Therefore, even supranational institutions have used different models of the engagement theory as a basis to define academic performance and prevent school dropout (OECD 2003, 2013b).

The engagement theory as a multidimensional construct has been established as a model composed of a variable number of dimensions (see Figure 3). However, the three-dimensional configuration proposed by Fredricks, Blumenfeld, and Paris (2004) is currently the most widely accepted, and has since been validated by a large number of studies (Archambault et al. 2009a; Archambault et al. 2009b; Jelas et al. 2016). Despite continuing discrepancy in the number of dimensions—between two and five dimensions depending on the authors—, most authors who follow the model by Fredricks, Blumenfeld, and Paris (2004), generally agree that it is made up of a behavioral, a cognitive, and an affective or emotional dimension. The *behavioral dimension* would refer to all those behaviors carried out by the students who are interested in learning and reaching academic achievement, such as regularly attending school; arriving on time and bringing the required material; actively participating both in activities developed in the classroom and those developed at school; behaving appropriately and following the rules; focusing their efforts and attention on homework and bringing homework completed, among others. The *cognitive dimension* refers to all the thoughts, beliefs, and perceptions that learners have regarding the importance of academic work and the subsequent effort, as well as the cognitive and metacognitive strategies that students must develop in order to build significant learning processes. The *affective or emotional dimension* includes the feelings and positive and negative attitudes which the students may have about school, their learning experiences, and the relational climate within the school: whether they experience positive or negative emotions when studying; have a positive relation with their partners and teachers; and have feelings of belonging to their school.

The relevance and value of this new approach based on the engagement theory regarding academic failure and achievement has been demonstrated by performing a literature search on two important databases —SCOPUS and WOS—, using terms such as; "school engagement" or "student engagement," combined with "school success," "school failure," "underachievement," "school completion," "school retention" or "academic achievement." After selecting the peer reviewed articles in the field of education and psychology, a total of 225 studies were obtained, which allowed for a thorough analysis its evolution. As reflected in the chart (see Figure 3), the subject started to gain greater importance in the 21st century, and from 2008 to the present has showed a strong upward trend; and 2015 proved to be the most productive year overall.

Table 1. Some of the engagement models proposed to date. Own elaboration based on Christenson, Reschly, and Wylie (2012), Reschly and Christenson (2012), Fredricks et al. (2016), Wang and Degol (2014), Appleton et al. (2006, 2008), Fredricks et al. (2004), Skinner et al. (2008)

Authors	Behavioral dimension	Cognitive dimension	Affective-emotional dimension	Other dimensions
Finn (1989, 1993)	*Participation* -Follow the rules, attendance, pay attention and answer, bring material -Enthusiasm, being proactive, and making an effort -After-school, social, and sport activities -Decision-making		*Identification* -Feeling of belonging -Assessment of academic achievement and its applicability to real life	
Furlong et al. (2003), Jimerson et al. (2003)	*Behavioral* -Actions that may be observed	*Cognitive* -Beliefs -Perceptions	*Affective* -Feelings towards peers, teachers, and school	
Fredricks et al. (2004)	*Behavioral* -Participation in academic, after-school, and social activities within the school -Persistency (homework completion, attendance and punctuality, rules compliance)	*Cognitive* -Investment in learning -Reflection -Willingness to make an effort -Approach to the perceived failure -Preference for challenges -Flexible problem resolution -Independent work styles	*Emotional* -Positive or negative reactions towards school aspects, school in general, teachers, and classmates -Positive relation with the institution	
Appleton et al. (2006, 2008), Christenson et al. (2008), and Reschly and Christenson (2012)	*Behavioral* -Curricular and extracurricular involvement -Attendance and punctuality -Behavioral problems (expulsion, punishment, submission to the school principal)	*Cognitive (mediator)* -Assessment of the learning (establishment of targets) -Self-regulation -Importance of school for personal aspirations	*Affective (mediator)* -Connection with school -Identification /feeling of belonging to the school	*Academic* -Completion and accuracy of homework -Time spent on homework -Credits left to graduate In-classroom performance
Skinner et al. (2008)*	Behavioral engagement -Intensity, involvement, absorption, proactive to taking action, attention, effort, persistence		Emotional engagement (adaptive motivation) -Enjoyment, pride, enthusiasm, fun, interest, satisfaction, vitality	
	Behavioral disengagement -Giving up, lack of preparation, mental decoupling, leaving, distraction, passivity, lack of attention		Emotional disengagement -Anxiety/ concern, shame, indifference, sadness, self-blame, boredom, frustration	

Authors	Behavioral dimension	Cognitive dimension	Affective-emotional dimension	Other dimensions
Martin et al. (2010)*	Adaptive behavior (adaptive engagement) -Planning -Persistence -Task management	Adaptive cognition (adaptive motivation) -Self-efficiency -Addressing the master task/learning -Assessment of the learning		
	Maladjusted behavior (adaptive disengagement) -Self-handicapping -Disengagement	Maladjusted cognition (maladjusted motivation) -Failure avoidance -Uncertainty management		
Lam, Wong, Yang, and Liu (2012)	Behavioral -Involvement in activities within the school -Effort to learn	Cognitive -Significant and deep processing	Affective -Joy of learning -Joy of school	
Pekrun and Linnenbrink-Garcia (2012)	Behavioral -Effort -Persistence	Cognitive -Attention and memory shaped by the emotions	Motivational -Goals	Cognitive-behavioral -Problem resolution -Learning strategies -Self-regulation (metaemotional, metacognitive, and metamotivational strategies) Socio-behavioral -Social behavior in academic tasks (direct/online)
Reeve (2012)	Behavioral -Attention and focus on the homework -Persistence -Effort	Cognitive -Use of self-regulation strategies -Use of deep and personalized learning strategies -Search for a deep understanding	Emotional -Presence of emotions facilitating the task (enthusiasm, curiosity, interest...) -Absence of emotions hindering the task (fear, frustration, anxiety, rage...)	Agentic -Active role of the student as enriching element of the learning activity -Proactive and deliberate construction of knowledge by the student
Fredricks et al. (2016)	Behavioral Participation in academic, after-school, and social activities within the school	Cognitive -Investment -Reflection Willingness to make effort	Emotional -Positive or negative reactions towards school aspects, teachers, and classmates	Social -Sharing ideas Broadening others' ideas

*Some authors identify two continuums per dimension.

Among the selected articles —most of them from the United States, the European Union (mainly from Portugal), Canada, and Australia— there are a variety of different kinds of studies and contributions. Firstly, there are certain theoretical reviews of the construct of engagement suggesting different theoretical models and future research lines. Secondly, there are correlating studies in which the relation with family, school, motivational, ethnical, and socioeconomic variables, among others, are analyzed. Lastly, a group of studies assessing

program implementation in order to increase engagement and encourage the design and validation of different assessment instruments is also particularly worth highlighting.

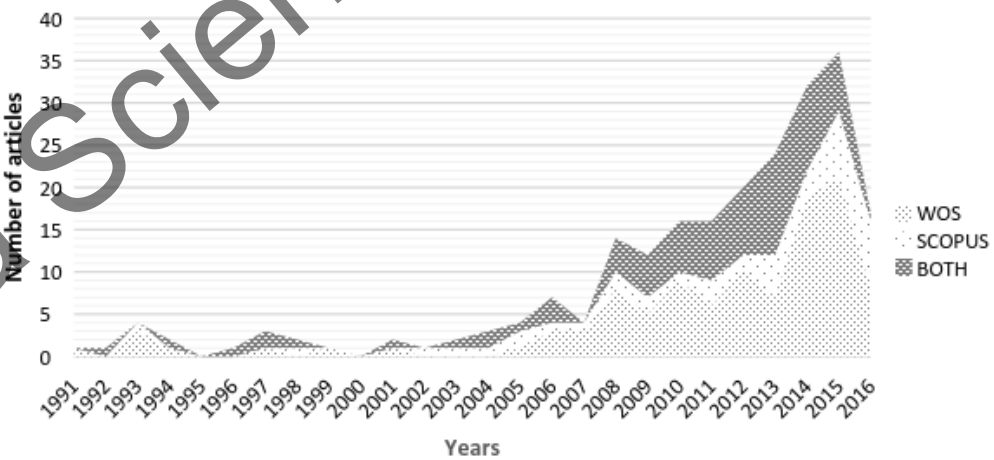
In the light of the results, the "engagement metaconstruct" can therefore be considered a relatively new field of research that has emerged given the increasing need to address school issues from a variety of different points of view. Many researchers are fascinated by the possibilities provided by this new research line for a more holistic understanding of the dropout phenomenon as a whole, as well as the early identification of students at risk of leaving their studies.

Additionally, this approach is also a relevant to the general population, due to its enormous potential to encourage higher academic achievement and quality of life among young people in general, regardless of their different socioeconomic levels, by fostering the achievement of good academic results, reducing the probability of developing high risk behaviors and mental health problems and generally promoting greater socioemotional well-being, and contributing to the achievement of positive results at work as well (Appleton, Christenson, and Furlong 2008; Christenson, Reschly, and Wylie 2012; Fredricks, Filsecker, and Lawson 2016; Wang and Degol 2014; Wang and Fredricks 2014).

Therefore, it is crucial to better understand both the concept of engagement and the theoretical models that have been proposed in order to more effectively address the implications of adopting this approach for the daily practice. First and foremost among these is to enhance the processes leading students to the higher overall academic achievement.

ENGAGEMENT, KEY TO STRENGTHENING ACADEMIC ACHIEVEMENT PATHWAYS

Since the term *engagement* was first used in 1985 in a publication by Mosher and MacGowan, there have been several studies on this new conceptual framework carried out simultaneously in two branches (Appleton et al. 2008; Eccles and Wang 2016).



Source: own elaboration based on data from databases WOS (core collection) and SCOPUS.

Figure 3. Articles per year about engagement and trajectories of success/failure.

The first research line focused on the *prevention of school dropout*, especially among high-risk groups, e.g., people with low sociocultural status, ethnic minorities, migrant background, etc. Recently, a number of studies have confirmed that one of the groups with the highest risk of school dropout is that of students belonging to ethnic minorities (European Commission 2014; Council of the European Union 2015; Rumberger and Rotermund 2012). For this reason, it is important to address the relationship between engagement and school achievement/failure within this student group. Bingham and Okagaki (2012) have pointed out that although this student profile tends to demonstrate low overall academic performance often related to low levels of engagement, certain studies have found high levels of engagement in the relational aspect (with peers), appreciation for education, and positive emotional aspects. These same authors provided tips to understanding which conditions either limit or encourage engagement among students belonging to minorities. On the one hand, the engagement decreases when perceiving discrimination —although it would depend as well on beliefs regarding the importance of school— but the cultural identity would also influence in a positive way, especially among girls. On the other hand, the existence of compatibility between ethnic/cultural affiliation and academic identity —even the adoption of bicultural identity— may encourage an increase in the level of engagement. Likewise, the positive influence that parents, teachers, and peers can potentially exert is noteworthy. More specifically, the quality of teacher-student relationship, their expectations, and their pedagogical practices appear to be the most significant variables, and can sometimes even buffer for low levels of support at home. Along this same line, it is important to analyze whether there is any discontinuity between the school and the family context, and whether the low engagement usually perceived by teachers is actually high accordingly to the home culture. Finally, the role of parents —good relationships and habits and high expectations for their children—, peer support and assessment of school issues, and the presence of young people belonging to the same ethnic group are all also worth mentioning.

The second research line has been developed by researchers interested in the *psychological theories of motivation*, which introduces concepts like self-determination, goal orientation, intrinsic motivation, causal attributions, self-efficacy, value-expectancy, cognitive social theory, etc., by authors like Bandura, Pintrich, Schunk, Eccles, or Blumenfeld. This line of research has consistently emphasized the existence of difficulties resulting from the overlapping of both the conceptual frameworks of engagement and motivation. However, it must also be highlighted that there have been a number of developments in the understanding of the relation between these two constructs, which currently now accepts that motivation is the internal driving force of the engagement; in other words, the engagement is the behavioral expression of the motivation (Boekaerts 2016; Eccles 2016; Eccles and Wang 2012; Martin 2012; Skinner and Pitzer 2012).

The first consequence of the existence of these two aforementioned research lines —and the lack of convergence between them— is a lack of conceptual clarity that often leads to different definitions, which are usually focused only on partial aspects (Eccles 2016). This conceptual fragmentation somewhat hinders the future development of engagement theories and limits both the construction of reliable and valid assessment instruments and the design and evaluation of programs that enhance engagement among young people. Therefore, unfortunately, the great potential of the construct that has been suggested by theorists, professionals and politicians (Azevedo 2015; Boekaerts 2016; Eccles 2016; Christenson,

Reschly, and Wylie 2012; Fredricks et al. 2016; Wang and Degol 2014) has not properly developed as of yet.

Nevertheless, these constraints on conceptual and dimension multiplicity do not negate the overwhelming similarities regarding engagement theory as a whole (Boekaerts 2016; Eccles 2016; Fredricks et al. 2016; Reschly and Christenson 2012; Wang and Degol 2014). In this regard, the following conclusions should be highlighted:

- The engagement theory is a multidimensional —including cognitions, emotions, and behaviors— and multilevel construct —which may be studied at an institutional or classroom level, in addition to a variety of specific learning activities.
- The theory is different from the motivation, the latter concept is understood to be the background or driving force, while the engagement is the expression of this motivation.
- The theory could be further improved by operating within the context surrounding the students which constantly influences them.
- There is not a single engagement pattern, but rather several diverse profiles ranging in stability depending on the level of engagement in each dimension.

In addition to these common aspects, the relationship between engagement and academic achievement or school dropout is also essential. Different studies have proved both the relationship between engagement and dropout as well as between engagement and academic failure/achievement. In this regard, two additional relevant longitudinal studies which address the relation between engagement pathways and the subsequent probability of dropout should be highlighted as well.

In the first one (Archambault et al. 2009b), the three-dimensions model by Fredricks, Blumenfeld, and Paris (2004) proved its validity. A cognitive, emotional, and behavioral engagement monitoring study was carried out using Canadian students aged from 12 to 16 years old, that is, grade 7-11. It revealed that students who had a sharp decline in the behavioral component or low engagement from the beginning were more likely to leave their studies prematurely. Although it is rather surprising that cognitive and affective dimensions did not provide further predictive value, the authors suggested that they would have an influence on the behavioral dimension —with predictive value—, with particular relevance to levels of basic participation and rule compliance.

In the most recent study (Lamote et al. 2013), which only considered the behavioral and emotional dimensions, the probability of dropout according to the engagement pathways among students from 12 to 16 years old is studied through survival curves. Results showed that those students with low levels of behavioral and emotional engagement and those with less stable patterns over time are more likely to drop out. These findings are significant because they point out the need to identify which are the students with low engagement levels from the beginning, or whether they have experienced a decline in order to implement early interventions.

The studies carried out to analyze the influence of engagement on academic achievement and school dropout are extremely relevant, in addition to those framed within a more contextual approach. Lam et al. (2012) provides a contextual approach of the engagement according to the ecological model proposed by Bronfrenbrenner in 1986, which suggests that

microsystems (family, school, peers) have the greatest direct impact on people since these contexts are their primary developmental background. So, bearing in mind the contributions of those authors as well as a number of additional researchers (Appleton et al. 2006; Fredricks, Blumenfeld, and Paris 2004; Reschly and Christenson 2012), it is necessary to describe the variables which facilitate or precede the engagement according to their different contexts.

In relation to family microsystem, it is crucial that the students should have access to learning resources at home and feel supported both emotionally and academically by their parents. Furthermore, parents should have greater adjusted goals and expectations for their children, monitoring their progress at school and the completion of their homework according to their level of autonomy and age.

With regards to the peer microsystem, there must not be any kind of aggression —in both terms of victim or aggressor—, and students should be able to count on the support of friends and classmates. Likewise, the students should regularly attend classes, share expectations, beliefs, and ambitions in terms of school and success, and make a great effort to succeed.

Regarding the school microsystem, the institution and classroom level differ markedly. It is advantageous at the institutional level to promote the support for mental health and academic issues; enhance the development of the feeling of belonging to the school; balance the disciplinary and authority practices; provide opportunities for student participation in the decision making process; encourage a positive relational climate with classmates and teachers; organize cooperative activities in which both teachers and learners may participate; and work from clear and consistent goals and from a significant and practical curriculum. It is positive factor as well that the center is small, in order to encourage the creation of close links between the agents of the education, and be chosen only after careful considerations have been made. At the classroom level, the teacher-student relationship is crucial, where teachers play a very important role in the construction of an adjusted learning environment which enhances recognition, support, and assessment. Teachers should likewise be able to meet the demands regarding competition, belonging, and autonomy of the students as well as be perceived as significant links to the learning process. The classroom structure should be centered on setting clear and consistent goals, expectations, and consequences, encouraging a commitment to following the rules, strengthening positive attitudes, and creating a work-oriented environment. Such learning environments would also provide challenging, fun, and genuine activities, focused on arousing student curiosity, encouraging collaboration, enhancing talent, and facilitating participation, according to their age and ability, in their conception, implementation, and evaluation. Regarding this issue, Tarabini et al. (2015) stressed the importance of identifying facilitators and inhibitors to engagement within the school context, given that school has a greater role than generally tends to be attributed to it.

In short, the most immediate student contexts —family, school, friends— must be a strong source of positive influence for the students to continue studying and hence achieve their educational, professional, and life goals.

In conclusion, after analyzing both the theoretical framework and the studies, regardless of the specific approach assumed, it is clear that engagement is primarily committed to the study of the cognitions, emotions, and behaviors of students in order to construct significant lessons and boost their academic achievement opportunities. Students are ultimately influenced by their academic context, which in turn plays a central role in the process of linkage or disengaging from the educational system, and their final decision to whether or not

to leave their studies early. The unavoidable consequence of this situation is the relationship that is necessarily created between the engagement and another key construct: self-regulated learning, a concept which refers to the understanding and explanation of how people have an active management of their own cognitive, motivational, and behavioral functioning within educational contexts. Hereafter, some basic notions on self-regulated learning and the degree of mutual influence between both constructs will be developed.

ENGAGEMENT AND SELF-REGULATED LEARNING

Since the inception of the "self-regulated learning" concept, several models have emerged and been developed in order to define what it is exactly and what its main components are. However, all of the models are based on the assumption that students can actively regulate their cognition, motivation, and behavior, and, through these self-regulatory processes, ultimately reach their goals by increasing their academic achievement and performance (Dembo and Eaton 2000; Zimmerman 2000). That is, students become the main agent in both their own learning and performance. Likewise, they also share the inherent assumption that there is a need to combine the cognitive, metacognitive, and affective-motivational components in order to explain both learning and performance (Boekaerts 1999).

In addition to these aspects, all the theoretical models of self-regulated learning share four basic principles that characterize this construct (Pintrich 2000, 2004). First, they are based on the constructivist perspective, stressing the active role of the individual in the learning process; therefore, students construct their own learning, significance, goals, and strategies according to the available information from the role of an agent which allows them to take control and regulate their own learning process and academic performance (Zimmerman 2002). Second, students can control, monitor, and regulate —to a certain extent— specific aspects of their own cognition, motivation, and behavior, in addition to specific characteristics within their environment as well. Third, students can set goals which should guide their learning process, and adjust their cognitive and motivational processes in order to achieve them. Lastly, these models consider self-regulatory behaviors as mediators between the personal and contextual aspects of their learning on one hand, and their academic results on the other. In this regard, the metacognitive process behind the cognition, motivation, and behavior of self-regulation involves controlling and regulating the activities being conducted, which in turn mediates the relations between the individual, the context, and the performance. This implies that a crucial characteristic is that learning and performance are not individual characteristics, but rather the result of a dynamic process that feeds back on itself and is continually changing (Boekaerts 1999).

Using these common assumptions, several authors have developed different theoretical approaches and models in the last 30 years which have contributed to the identification and description of the key dimensions related to self-regulated learning, and in doing so have provided a theoretical framework which allows for the integration and relation of the research results from the various conceptualizations and definitions. Two of the strongest and most comprehensive research lines both from a theoretical and applied perspective are those proposed by Zimmerman and Pintrich, who developed both conceptualizations of self-

regulated learning, providing explanatory and integrative frameworks of every component based on a careful study of the key dimensions of self-regulation.

Since the 1980s, Zimmerman has been developing a self-regulation model based on the sociocognitive approach proposed by Bandura, by adopting a number of its characteristic features like the triadic conception of human behavior, the role of self-efficacy beliefs, and the importance of observational learning. This sociocognitive model of self-regulation assumes the interdependence of social, environmental, and personal influences as a central feature. Furthermore, it defines self-regulation as a triadic interaction between personal —both cognitive and motivational—, environmental, and behavioral processes (Zimmerman 2000, 2002; Zimmerman and Shunk 2001), making it a multidimensional process focused on the adaptive and adjustable nature of self-regulated actions. It also stresses the crucial importance of the development of self-regulation both in academic achievement and the adaptation to the academic world, and especially in terms of academic performance (Schunk and Zimmerman 1997).

From the study of two components of self-regulated learning associated with high student performance in terms of learning strategies and motivational beliefs, Pintrich and his collaborators made up a model which has undergone a number of different alterations (García and Pintrich 1994; Pintrich 2000, 2004) and is considered one of the best references in the study of self-regulated learning. The central aspects of this approach include the idea of learning as a complex process which considers the different sub-processes and the different areas involved; defining self-regulation as an active and constructive process where individuals establish a number of goals for their task and try to plan, monitor, control, and regulate their cognition, motivation, and behavior, and always bearing in mind the contextual characteristics within their environment (Pintrich 2000, 2004). Thereby, the analysis of the self-regulated learning is organized in four-stages —planning, monitoring, review, and assessment— and four structure areas —cognitive, affective-motivational, behavioral, and contextual.

Recently, the importance of self-regulated learning has been increasing both in literature and in research, revealing that students who receive training in strategies of self-regulation—such as the goal-setting, time management, etc.— have greater levels of engagement and demonstrate better academic performance (Núñez et al. 2013). Upon careful analysis of the constructs of self-regulated learning and engagement, it becomes obvious that these concepts are closely related and profoundly influence each other. Currently, as Wolters (2016) points out, the degree of overlap between both constructs is an issue that has yet to be solved, given that both concepts are considered significant reference frameworks at a theoretical level and in research, and are extensively used to understand the functioning and results of students according to their academic contexts (Wolters and Taylor 2012).

Different authors have pointed out that there are a number of similarities and common elements between these conceptual frameworks (Järvela et al. 2016; Wolters and Taylor 2012). Therefore, it is noteworthy that both research on self-regulated learning and that being carried out on student engagement include a wide range of models sharing some key concepts, but also a certain degree of variability. Therefore, both conceptual frameworks are considered multidimensional, given that they refer to different areas, stages or sub-processes within the performance of students, which are considered to be in more comprehensive model; this multidimensional conceptualization implies cognitive, motivational, and

socioemotional learning aspects in all cases. Another common feature worth mentioning is that both self-regulated learning an student engagement have been studied as mediation processes providing a bridge between personal and contextual factors on one the hand, and between the academic results and achievements on the other. In this regard, both of them have been used in order to distinguish between more or less efficient students and to explain their academic achievement. Finally, it is noteworthy that even the definitions of both concepts tend to use common terminology and concepts that are central to the other concept. For example, it has been said that when students are actively committed to their own learning, they tend to show self-regulated learning, and even some theoretical descriptions have determined self-regulation as a component or part of the engagement process (Boekaerts 2016; Järvela et al. 2016). Clearly, there is an obvious conceptual overlap, especially when it refers to the field of cognition or cognitive engagement.

Nevertheless, there are clear differences between these key constructs of learning. First of all, there are some disagreements in the classification and distinction of certain similar concepts which have been studied in each conceptual framework, e.g., seeking help. Also, there are differences regarding the aspects which have been given more emphasis or importance, and differences in the way the similar concepts are addressed, too. One such example is motivation, which is a key aspect of self-regulated learning; motivational processes are considered to play a crucial and continuing role throughout self-regulation events, but are not considered to have the same importance within the theoretical framework of engagement. Secondly, the self-regulation models have stressed the students' ability to take a proactive role and to be agents in many of the parts of their academic functioning; meanwhile, the engagement models have not placed the same emphasis on this important aspect. Thirdly, there is a certain disparity between the relevance and the scope attached to several types of metaknowledge; although both fields consider that metaknowledge is critical, it has not been explicitly considered or integrated to the explanatory models in the field of engagement. Lastly, some authors also highlight that self-regulation refers to the ability to regulate and monitor the whole process of learning; in this regard, it implies a greater understanding and control on the processes involved, which is lacking in the engagement theory (Boakearts 2016; Boekaerts and Corno 2005).

In order to address this overlap, the most relevant authors of both theoretical frameworks continue defend different positions on how to solve this conceptual chaos.

On one hand, the first line emphasizes the need to continue investigating while considering both to be separate —albeit connected— constructs due to the current conceptual confusion caused by maintaining an analogy between them. Therefore, Boakearts (2016, 81) believes that it is essential to distinguish between the two concepts bearing in mind that "the engagement process and the self-regulation process are parallel paths with interconnecting side paths."

On the other hand, other authors (Cleary and Zimmerman 2012; Järvelä et al. 2016; Wolters and Taylor 2012) consider it necessary to include both constructs in a wider and more integrating framework in order to analyze what students do to be more effective and efficient within academic contexts.

CONCLUSION AND FUTURE PROSPECTS

Currently, the school dropout rate is considered to be one of the main educational issues that need to be addressed by governments at an international level due to its negative impact on both individuals and society. Despite the multiple attempts to effectively understand and address this phenomenon, there are many students that continue to leave their studies early, thereby reducing their chances for personal, professional, and social promotion, and limiting their contribution to the development and innovation of the society in which they live. However, over the last three decades, the engagement metaconstruct has emerged as a sound alternative to the poor corrective approach that is being used at the moment. This more positive approach, focused on the identification of variables preventing dropout and encouraging achievement pathways and permanence in the education system, has gained greater importance among theorists, professionals, and politicians alike due to its ability to understand and prevent the decoupling process leading to the decision to leave their studies, which is generally influenced by a mixture of both internal and external variables. However, the engagement theory has been criticized due to the following aspects: the entire explanatory potential appears to be overshadowed by the lack of conceptual agreement, its substantial overlap with the other psychological theories about motivation and self-regulated learning, and its apparent lack of assessment instruments with good psychometric properties.

In order to overcome these constraints, different authors have suggested some basic keys to guide future research in this field (Boekaerts 2016; Eccles 2016; Fredricks, Blumenfeld, and Paris 2004; Wang and Degol 2014).

Firstly, it is necessary to delve into the construct from a multidimensional level, while trying to achieve a greater clarity and consensus regarding the number and relevance of its dimensions, and the elements present at the core of engagement theory. Doing so would allow it to be more easily distinguished from other related theories and avoid an overlap with other constructs like motivation and self-regulated learning. As a result, researchers could move in the same direction and develop a theory underpinning the evidence-based intervention programs simply by properly delimiting the field of study.

Secondly, it is crucial to address the developmental aspects of the engagement theory through long-term longitudinal studies. Therefore, it would be possible to design more adjusted interventions that take into account the differences in the levels of engagement according to the age of the students, and pay special attention to the vulnerability of young people during periods of transition between the various educational stages.

Thirdly, it requires further research into its potential positive impact on the interaction between individuals and their contexts. It should not be forgotten that students influence, and are influenced by, the systems of their immediate environment —school, family, and peers group—, and it is therefore crucial to determine which aspects within these contexts can be improved in order to achieve a greater level of engagement at all educational levels.

Lastly, it is important to clarify the importance of setting both student and teacher goals, in order to better understand the role they play in the engagement process. Although there has traditionally been a greater emphasis on the behavioral dimension, recent studies in the filed of neuroscience have revealed the importance of the role of emotions in cognitive processing, meaning that positive emotions influence positively in learning, while negative ones generally create interferences.

Finally, it would be convenient in the future to use multiple study methods instead of entirely relying on the self-reports for data collection. More concretely, the benefits of combining both quantitative methods —clarifying which factors are involved with the engagement— and qualitative methods —such as monitoring, in-depth interviews, experience sampling methods, etc.— must not be overlooked as they are essential to future research into the engagement theory.

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Chapter 3

PROGRAMS TO PROMOTE SELF-REGULATED LEARNING IN DIFFERENT EDUCATIONAL STAGES

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ABSTRACT

Self-regulated learning in recent decades has become a focus of common interest between researchers and educators. That interest lies in understanding that the student must be the main actor in the study process and in the need to train students to be able to build their learning autonomously. Many students put in place strategies to achieve good academic results, but other students do not use adequate learning strategies to achieve satisfactory academic results, showing deficits in the different motivational, behavioral, cognitive and metacognitive strategies. In this chapter we present a series of programs to promote the skills of self-regulation among learning students from elementary education to university. We use a common framework based on the socio-cognitive model of self-regulated learning and an inductive methodology through narratives. The results observed so far show how these tools, regardless the educational stage, favor an improvement in the motivational and strategic level among the students who work with them.

Keywords: self-regulated learning, intervention programs, elementary education, secondary education, university

INTRODUCTION

In the last few decades, learning self-regulation has become a common focus among investigators and educators. Said interest comes from understanding that the student must be

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the main actor in the study process and from the need to train the students to be able to build their learning autonomously (Zimmerman 2011).

Many students use strategies to achieve this learning efficiently, but other students do not utilize motivational, behavioral, cognitive and metacognitive strategies to achieve satisfactory academic results, showing a shortage in the different process phases of self-regulation learning (Núñez et al. 2013). In this chapter we describe three programs designed to promote self-regulated learning in students from elementary education to university. The programs use a framework based on the social-cognitive model of self-regulated learning and an inductive methodology through narrations: *Yellow trials and tribulations* (Rosário, Núñez and González-Pienda 2007a, 2007b) for elementary school; the collection named *Testas' (mis)adventures* (Rosário 2002a, 2002b, 2002c; 2003; 2004a, 2004b) for 5th through 9th graders; and the program entitled *Letters from Gervase* (Rosário, Núñez and González-Pienda 2006) for 1st year university students.

These programs developed in the University of Minho-Portugal, in collaboration with the University of Oviedo-Spain, have a series of stories and materials of guided work about them. The humorous narrations, written in a language close to the student, are told in first person by the main character, who is similar to the students to whom the tool is directed. This way, the students, through the analysis of the similarities between the stories told and their own experience, reflect on the cognitive, metacognitive, motivational and behavioral strategies captured in them and later on put them into practice, with some guidance. The results observed so far show how these tools, regardless the educational stage, favor an improvement of the motivational and strategic level among the students who work with them. The reader of this chapter can find some references in paragraph explanation of each program.

SELF-REGULATION LEARNING

Nowadays, formal education is changing the ways of thinking and working in education. This poses a reconceptualization of teaching, focusing the educative processes from a perspective in which the center of activity is the student. Special attention is paid in the necessity of putting the focus on the personal implication and the commitment of the person who is learning, autonomously and permanently. All this accompanies a clear objective: for the students to finish their studies having acquired a set of competences that guarantee their adjustment to a society under continuous change. Also to ensure they can become qualified, competent and competitive people inside and outside of the academic sphere and their reference geographic context. Thus, in the last few decades, learning self-regulation has become a fundamental topic in educative investigation and practice.

The reasons that explain students' high or low performances are multiple and complex (Fernández et al. 2013). Throughout several decades, student learning has been considered the result of the confluence of personal variables such as intelligence or diligence. It was not until the last decades of twentieth century when new points of view about the analysis of individual differences of the students appeared, like metacognition or the study of affective-motivational variables involved in learning (Zimmerman 2002). Other variables earning relevance included lack of motivation to get involved in the homework, lack of previous knowledge or inefficient use of learning strategies required in each moment (Bembenutty 2011; Fathi and Eissa 2010).

Self-regulated learning was defined by Zimmerman (1989) as 'the cognitions, affects and behaviors originated by the students who are oriented, systematically, to the achievement of their personal goals', that is to say, 'an active process in which the students establish the objectives that guide their learning, monitoring, regulating and controlling their cognitions, motivation and behavior with the intention of accomplishing them' (Rosário et al. 2012). A large body of investigations during the last three decades suggests that learning self-regulation is a construct with an important explanatory potential of the learning processes and, thus, of academic success (Boekaerts and Corno 2005; Núñez et al. 2011). And this is so because high levels of self-regulation in the educative area favor strategic, deep and significant learning and positive academic results (Cleary and Chen 2009; Miñano and Castejón 2011).

Moreover, such levels of control and autonomy over one's own learning process depends not only on the use of cognitive and metacognitive strategies, but also on the regulation of different motivational and behavioral variables such as daily working habits, the student's goal orientation, the perception of self-efficacy to do academic activities, and the utility or instrumentality perception of the use of certain strategies (Al-Harthy, Was and Isaacson 2010; Kolić-Vehovec, Rončević and Bajšanski 2010; Liem, Lau and Nie 2008; Neuville, Frenay and Bourgeois 2007).

Much of the investigation around self-regulated learning has focused on describing the characteristics of students who self-regulate their learning and of those who do not do so. In general, the different investigators seem to agree in that the students who self-regulate their learning are active agents that control their study process; they plan the learning tasks and control the time and effort accordingly; they know and use cognitive and metacognitive strategies; they direct the learning towards the achievement of the goals they set, monitoring the process and modifying it accordingly; they adjust the strategies to their academic goals and show adaptive personal traits (e.g., high levels of self-efficacy), in addition to displaying regulation and volitional strategies to avoid deviating from the goal (Bandura 2001; Pintrich 2004; Zimmerman 2000).

We present a series of intervention programs to promote the students become self-regulated learners; these tools come from the University of Minho-Portugal in collaboration with investigators from the University of Oviedo-Spain and with elementary, secondary and university school teachers from both countries. These programs unify theoretical and practical knowledge about learning self-regulation with the ultimate goal of helping the students regulate their learning process, their motivations and strategies to guarantee that they can face the academic tasks with expertise, responsibility and autonomy. The materials created are designed to be implemented in elementary education, 3rd and 4th grade: *Yellow trials and tribulations*, Rosário et al., 2007b); elementary and secondary education from 5th to 9th grade: Collection *Testas' (mis)adventures* (Rosário 2002a, 2002b, 2002c; 2003; 2004a, 2004b) and university: *Letters from Gervase* (Rosário et al. 2006).

These programs share a general theoretical framework, as well as similar characteristics and methodological implementation proposals; all these common aspects are shown below, specifically describing each of them.

THEORETICAL FRAMEWORK OF THE PROGRAMS

The conceptualization of self-regulated learning has been designed from the different theoretical families, creating a variety of models that have contributed to a certain scattering and confusion around the concept. Nevertheless, in spite of the differences among theories, all defend the basic postulation that the students can actively regulate their cognition, motivation and behavior and, through these self-regulative processes, achieve their goals and bolster their academic performance (Dembo and Eaton 2000; Zimmerman 1998). Likewise, there is complete consensus about the importance of training these aspects because, nowadays, there is no possibility that students be mere content receptors; the ultimate goal of education is to accomplish that the students acquire a series of abilities that allow them to learn autonomously and permanently. For this to happen, it is necessary for them to become true experts in reflecting on themselves as learners, on the learning activities they perform, on how to obtain an efficient development of said activities and on how to adapt their strategies depending on the context or the moment (Pintrich 2004).

Furthermore, it is assumed that the self-regulated learning processes can be learned through the exposure to competent social models, through the teaching of self-regulation strategies, through direct practice and through feedback that they can receive about their behavior (Schunk and Ertmer 2000).

The programs presented in this chapter have been developed under a common theoretical framework, the Bandura's social cognitive theory (Bandura 2001) and the Zimmerman's social cognitive model of self-regulated academic learning (Zimmerman and Schunk 2008). This model perceives self-regulated learning as a cyclical process that is developed in three phases: a) *forethought phase*, which precedes the action and comprises the establishment of the goals, the planning of the resolution of the task and motivational beliefs; b) *performance phase*, which views the processes that happens during the learning, which affects the attention and the action; and, c) *self-reflection or reaction phase*, after the accomplishment of the task, which carries the evaluation of the learning process by the student, the causal attribution of the results depending on the planned goals and the emotional reactions of the student depending on the analysis carried out. These phases are considered dynamic, and, even though they are not strictly hierarchized, they are interdependent. The previous phase determines the execution during the realization phase. In addition, depending on which processes of self-reflection take place, the results again will influence the consequent phase of the following tasks.

However, the team that designed these investigation programs presents with them a self-regulated learning model based on the Zimmerman´s model, but is perhaps more parsimonious: the model "PLEE" (see Figure 1). According to this model by Rosário et al. (2006), the self-regulation process is developed, like the last, in three phases (PL: planning; E: execution; and E: evaluation), very similar to those in Zimmerman's model (2000), but that, also, follow cyclically in each of the phases. This way, the tasks developed by the student during the planning phase, at the same time, must be planned, executed and evaluated. This is the case with each of the phases.

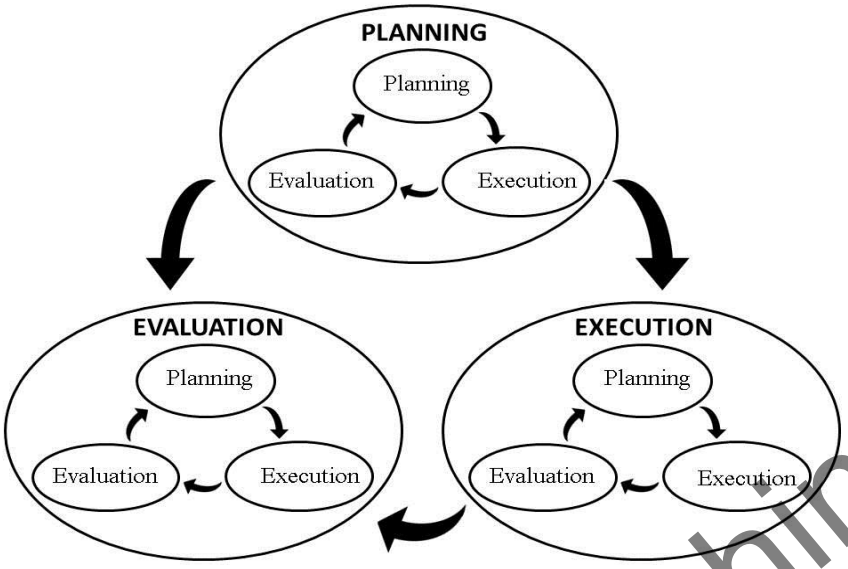

Figure 1. Phases of the PLEE self-regulation model (Rosário 2004a).

PROGRAMS MAIN FEATURES

There are many references in the literature that highlight the importance of explicit teaching of learning self-regulation strategies (e.g., initiative, control, perseverance and mastery of learning strategies). Such strategies can end up prompting favorable academic results (Camahalan 2006; Cerezo et al. 2010; Nota, Soresi and Zimmerman 2004; Núñez et al. 2011; Pintrich 2004; Zimmerman 2000) and a deeper learning of the content (Boekaerts and Corno 2005; Dignath, Buettner and Langfeldt 2008; Valle et al. 2008; Zimmerman 2008).

The students that self-regulate academically are able to control all aspects of their learning (before, during and after it takes place), showing high levels of competence in their cognition, motivation, behavior and context control (Zimmerman and Schunk 2001). It has been demonstrated that students who receive instructions about self-regulating processes commit more deeply to their tasks and ultimately show better academic results (Dignath, Buettner and Langfeldt 2008; Rosário et al. 2010; Zimmerman 2002).

The innovative character of this proposal lies in the use of a model, close the students, that helps them to discuss and learn from his own experiences. This way, all the programs comprise narrations (stories, tales, and letters) that are written humorously; the simplicity of the stories, told in narration, offer the opportunity to some students to see represented on paper problems and their solutions in an entertaining and easy-to-understand way (Randi and Corno 2000). Then, it is assumed that storytelling is a powerful educational tool, and story-tool programs are a good way to do it.

The standpoint of the social-cognitive focus is considered since students often learn vicariously, observing how other people behave (Zimmerman and Schunk 2001) and not exclusively practicing (Pintrich and Schunk 2002). However, as Shunk (2008) took into account, these learning sources could not only be people, but symbolic objects or non-humans as happens with cartoons or through the reading of books and magazines as well. This kind of

learning allows the subject to learn without experiencing the consequences of his executions in person. It can be understood complex academic learning appears through observation and experimentation and that not all learning happens thanks to the direct practice (Pintrich and Schunk 2002). In the academic context, the observation of a model, even though it is a virtual or symbolic model, can serve as a guide to the acquisition of self-regulated competences, attitudes, beliefs and behaviors (Schunk and Zimmerman 2003).

Using a model similar to them but different enough at the same time, the stories of the programs become educative opportunities for students to reflect on their attitudes and behaviors in the academic sphere. In each of these programs, a main character of similar age and characteristics to the students involved has been chosen. With this structure, the narrations have an exemplifying and formative effect, something that has been used throughout history as a useful tool for the development of learning and competences (Shunk 2008). The students, as they are spectators, maintain a sufficient closeness to the story by being reflected but, at the same time, the sufficient distance to not see themselves involved, and allowing them to analyze each situation relaxed and reflectively. The narrations substitute a "real" mentor that, through the explanation of their personal experiences, helps the student identify the intervening factors in the situation or problem presented and reflect upon it to extract inductively the self-regulatory strategy that is being worked at the time. This stimulates the development of a metacognitive process that could boost a qualitative change and prompt academic success. This methodology helps the students work autonomously and engage deeply with the given texts. It invites them to submerge themselves in the stories to extract the information that they consider relevant and to which they can relate with their own experiences as learners. With this, the students think about the strategies gathered in the texts, and through these they "build their own learning story."

The learning self-regulatory strategies do not link to a specific curricular content. This offers the opportunity for the student to learn different strategies generally, that through his or her own personal construction he or she can transfer to situations and contexts related to his or her own academic surroundings and idiosyncratic and habitual activities.

GENERAL WORKING STRUCTURE OF THE PROGRAMS

The self-regulatory competence, under a social-cognitive focus, is supported by social resources and afterwards modeled to become controlled by the subject itself (González-Pienda et al. 2014), that is to say, the students can acquire or perfect their abilities through efficient models. According to Zimmerman (2000), the learning of self-regulatory abilities could occur following a series of steps that range from the observation of the subject of competent models, through the imitation of these, through the subject's self-control of these abilities in similar situations to those modeled, and to their self-regulation at the time of transferring the self-regulatory abilities to other situations.

That is why the general structure of the programs is designed to for some group work and some individual work, even though they maintain enough flexibility for application adjustment, taking the students necessities into account. Each working group must be accompanied by an educator or teaching facilitator, who is in charge of guiding these

sessions, helping the students extract and generalize the worked strategies, and revising their transference to the particular circumstances of each student.

The sequence of work is the same regardless of the educational stage in which it is being implemented. This sequence comprises three phases: 1) *reading* the corresponding narration; 2) *reflection* on the learning self-regulation phases and strategies compiled in the text read; and 3) *autonomous practice – revision* in which the students, with the help of the educator and through the specific tasks proposed in the programs, put into practice what they have learned (e.g., make a conceptual map with the following contents or organize a fun activity for you and your friends).

The content of the narrations and tasks, in their general structure, seeks to help students master three types of self-regulated knowledge learning: *declarative* (knowledge of the different strategies, for example, what is a conceptual map), *procedural* (knowledge of how to use strategies, for example, how to make a conceptual map) and *conditional* (when to use them, for example, with which type of content can its use be helpful) (Biggs 2006; Martínez-Vicente and De la Fuente-Arias 2004; Núñez et al. 2013). Dignath et al. (2008) in their meta-analysis observed how the most effective intervention programs in SRL were the programs based on social-cognitive models and which worked three types of learning strategies: cognitive (e.g., sorting of the information), metacognitive (e.g., planning and monitoring the sorting of the information) and motivational (e.g., revising the results and giving feedback in accordance).

The strategies of the programs vary according to the age of the students. Nevertheless, the learning strategies worked here fit the proposals made by Zimmerman and Martínez-Pons (1986) in one of their papers. These authors showed that students can carry out different learning strategies related to the tasks performance. These self-regulated learning strategies were grouped in 14 categories: self-evaluating, organizing, goal setting and planning, seeking information, keeping records and monitoring, environment structuring, establishment of self-consequences according to the execution, rehearsing and memorizing, seeking assistance of teachers and/or parents, and, lastly, exam revision, notes and texts (Nota et al. 2004; Zimmerman, Kitsantas and Campillo 2005). Apart from these, also studied are learning self-regulation strategies of the emotional and behavioral type, such as the control of the external and internal distractors, the management of the causal attributions of the task results or the regulation of dysfunctional emotional states like excessive anxiety.

In each of these cases, the working logic follows the previously described self-regulation model PLEE. It consists on planning, executing and evaluating any of the tasks carried out.

YELLOW'S TRIALS AND TRIBULATIONS

Program Description

Yellow's trials and tribulations is a story designed and written for children under 10 (from preschool [age 5] to elementary education [age 10]). In this case, the model characters are the colors of the rainbow. The book tells the story of the disappearance of the yellow color from the rainbow, as well as the adventures lived by the other colors while searching for their missing colleague. Thereby, a set of self-regulated learning strategies and processes are

presented, those employed by the colors of the rainbow while searching for "Yellow". The tool is designed to reflect the steps and strategies to use depending on the needs of the task and the moment so that, afterwards, students apply them at school and in their lives.

Format and Contents

The tool consists of a book that describes through texts a group of adventures lived by the colors of the rainbow while they look for their friend Yellow, who got lost in the forest. Throughout the search, the other colors meet new friends and learn self-regulating strategies to overcome the difficulties and the challenges that come across on their way. The narrative style confers this tool dynamism, allowing an ecologic adaptation to the specific learning context. Thanks to its non-prescriptive style, defiant and humorous, the kids have the opportunity to learn a set of learning strategies and to reflect upon the characters' situations, ideas and challenges that are similar to their own. This discursive proximity facilitates children's discussion and change of perspective in the face of the strategic contents shown in the stories, and from there on, the realization of a set of activities organized to develop the competences. The story was designed as a tale with the goal of working with the kids on a group of processes and learning strategies transversally among the curricular objectives: planning the tasks, establishing goals, organizing resources, monitoring the tasks, combating the distractors, evaluating the results of a story and, also, emotional and behavioral aspects present in learning. Even though the characters are colors and not kids, the language they use and the behaviors they show emulate children. Therefore, the students can identified with the characters, analyze the situations and afterwards compare the situations to the ones they live, advancing in new ways to do the academic tasks. For example, an excerpt from these narrations is introduced in which the attributions about the responsibility in learning are shown:

> (…) – Dear friends, the much anticipated picnic, the *Picnic of the Problems*, is about to start! – the Sloth announced slowly.
>
> - Who decided to start the picnic? I don't want to start. Wait a little bit longer – Rage said, shaking its foot to impress the other problems (…)
>
> – Well, I don't want the picnic to be here. I want it to be at some other place – desperately screamed Whim.
>
> That was a proper grouping of problems. Always eager to argue, cry and lie. They only calmed down a little when the great contest started!
>
> "Which is the main behavioral problem in kids?" This was the greatest challenge they had to overcome, and there were many candidates for *Emperor of the Problems*. But Lie, Sloth, Rage, Disobedience and Fear were the main candidates. Each of the problems had to go up to the stage, present a life motto and explain in detail how they aimed to dominate the lives of the little kids.
>
> Lie was the first one to speak:
>
> - My motto is: "It wasn't me." I'm never to blame for the mischief I manage. I never take the blame. It's easy: the others are always at fault (…) When the kids use me too much, the people stop believing them, even when it's true. In time, friendships are torn apart, parents get mad and difficulties grow. Then, when the kids regret everything and want to get rid of me,

it's very difficult. Ha, ha, ha, am I or am I not the winner? – Asked Lie to the audience. Ultimately, very few claps were heard. Lie was not very popular among the other problems.

The next candidate was Rage. He climbed to the stage disguised as a victim and bowed, getting much applause.

- Hello, I'm Rage. My motto has no words, only signs. When things don't go my way, when grown-ups or other kids don't pander to my every whim, I cross my arms, make a bad face and remain silent. Sometimes I also make a scene, shaking my feet and crying as if they were pulling at my teeth. With this attitude I force others to pay attention to me and, almost always, I get what I want—insisting is enough. Seriously, it almost always works.

-Bravo, bravo! – The audience screamed, and Rage left the stage smiling. (…) (*Yellow's trials and tribulations*, chapter 9).

The different chapters in the book are conceived to be read, discussed and worked through either in class or at home, providing opportunities to learn strategies both in and outside the academic field. As we are dealing with the smallest students, the general sequence of implementation can use some details that favor students' involvement in the stories such as: a) set a session stage, for example, sing a song about the colors of the rainbow or wear a badge saying "Yellow" before starting. These routines, linked to the details, help the students get ready for the task; b) as the reading can seem long for some children, it is important to make the story clear, visual and attractive—guaranteeing their attention and concentration—by using resources like intonation, staging, analysis of images from the book, emphasis on some parts or dialogues with action-suspense pauses (e.g., saying aloud their reflections, questions or preoccupations).

As for the activities in each session, a wide range of proposals have been designed to make the selection and the adjustment of those in each students group. Thus, the teachers have a list of activities fit for small children (e.g., activities that propose to apply the strategies to daily situations in preschool education, such as drawing pictures or making small puzzles) and others that, given their architecture, are cognitive challenges for the children from elementary education (e.g., activities that promote metacognitive thought). The teachers can adopt the processes and self-regulation strategies presented in the story and some of the activities given for each stage, for the planned tasks to work in class (e.g., the decoration of the school to celebrate peace day can follow the PLEE model presented, specifying and reflecting on each of the phases and the learning self-regulation strategies associated). For example, Table 1 shows the content of some sessions that can be worked with kids from elementary education.

Investigation

Yellow's trials and tribulations (Rosário, Núñez and González-Pienda 2007a, 2007b) comprise the most recently developed and published program of all. Consequently, the lesson's efficacy in improving the learning self-regulation processes among the smallest children has only been tested on a few occasions. However, currently, the results of its implementation among Spanish students from 3rd and 4th grade in elementary education will be published. Findings in Portugal with students from a gypsy background in 4th grade were published by Rosário et al. (2016). In this case, using the design of a quasi-experiment with an experimental group and a control group, the efficacy of *Yellow's trials and tribulations*

(Rosário, Núñez and González-Pienda 2007a, 2007b) was observed to improve the behavioral engagement and self-regulated strategies used by the experimental group. The program was developed along eight weeks, and the evolution of the kids from the experimental group and the control group was measured through an observational protocol.

Table 1. Summary of the contents of some sessions from the program *Yellow´s trials and tribulations* seen with kids from 3nd and 4rd grade from elementary education

Session 1. The beginning …	
Reading comprehension:	Questions about the chapter and task completion
Objectives and Skills:	Promotion of the ability of being respectful with peers. Development of class rules.
Activities:	Development of a confidentiality agreement. Production of a rules list.
Self-reflection tasks:	Why are we here?
Session 3. I make a plan, execution, and evaluation.	
Reading comprehension:	Questions about the chapter and task completion
Objectives and Skills:	Define the 3 phases of the SRL model: plan, execute, and evaluate.
Activities:	Fish origami, to implement the SRL model.
Self-reflection tasks:	Why is it better to divide goals into small steps?
Session 6. My slogan: "When I´m wrong, I also learn"	
Reading comprehension:	Questions about the chapter and task completion
Objectives and Skills:	Reflect calmly. Understand that if we do not find the answer on the first try, to become discouraged is not an option. Promote the ability to learn from failures.
Activities:	An activity in which students have to think about 3 syllable words starting with "TE".
Self-reflection tasks:	Why it does not matter if we are wrong? How could an error be a friend?
Session 9. Fool proof tricks: tidy notebooks, highlighting, and many schemes!	
Reading comprehension:	Questions about the chapter and task completion
Objectives and Skills:	Recognize the importance of LS. Learn how to take notes and highlight a text. Learn how to make a scheme and a mind mapping.
Activities:	Activity "the solar system" making a scheme of the proposed text.
Self-reflection tasks:	Why do schemes help us to review the school contents?
Session 10. I´m already a brilliant student!	
Reading comprehension:	The whole class makes a book summary
Objectives and Skills:	Promote the ability to argue and debate in an environment with diversity of opinions.
Activities:	Activity: "now you´re a super-student". Students have to advice classmates on how to improve achievement.
Self-reflection tasks:	Take home message. Students are asked to make a summary of the topics worked.

TESTAS' (MIS)ADVENTURES

Program Description

The program *Testas' (mis)adventures*, aimed at students between the ages of 11 and 16, follows the common methodology of implementation of all the programs. It is comprised of a series of books containing stories told in first person about the adventures of Testas, a student throughout his day-to-day school activities. These narrations constitute a medium through which the students work a range of learning strategies of daily use at school (e.g., goal establishment, group projects, procrastination, time management and problem-solving).

Testas' stories are compiled by a group of books that span from 5th to 9th grade in the Portuguese education system. Each book is designed for a certain grade, instead of including educative or cycle periods, which makes them more specific and ideal regarding other programs. It also allows for working every phase of the learning self-regulation in each activity, while emphasizing certain phases depending on the grade. Therefore, in 5th grade the planning phase is emphasized, in 6th grade the execution phase is emphasized, 7th grade the evaluation phase, etc. The volumes for the grades mentioned in Portugal are:

- 5th grade: 007.º Ordem para estudar [007th Order to study] (Rosário 2002a).
- 6 th grade: Elementar, meu caro Testas [Elemental, my dear Sparky] (Rosário 2002b).
- 7 th grade: Testas para sempre [Sparky forever] (Rosário 2002c).
- 8 th grade: O Senhor aos papéis, a irmandade do granel [Lord of trouble, the brotherhood of the caos] (Rosário 2003).
- 9 th grade: Testas o lusitano [Sparky the Luso] (Rosário 2004b).

This program tries to provide the students with a series of learning self-regulation strategies and processes, allowing them to "learn to learn" and improve their academic success.

Format and Contents

Testas, the main character from the stories, is a student like any other. Through the story of his day-to-day activities at school, focused on the tasks and activities, he describes how he faces the challenges of learning in real situations, always from the logic of the self-regulated learning model (PLEE). For this reason, the students, through the experiences of Testas' stories, have the opportunity to learn and reflect on a repertoire of strategies that can be useful in all aspects of their lives.

In Table 2, can be seen a summary of some sessions that can be used with students from the 7th grade. During the development of the texts, different style resources have been used to stimulate the interest and curiosity of the students. For example, in the texts the "interruption of the narrative sequence" prompts students to produce alternative solutions to the problems Testas encounters. In some instances, this interruption is in charge of a "voice-over" that, between parentheses, includes reflections about what happens to the main character at that given moment. This resource is about giving the students the opportunity to develop their

own solutions before the text uncovers them. "Contradiction" also has been used as a stylistic resource in the text, mirroring the problem and taking the topic to the absurd sometimes, as in the letter written by Aunt Leisure to her nieces:

> (…) – I'm writing you, my dear, because I feel obliged as part of your family to draw your attention so that you see reason and take the path that our family always follows: not doing anything in life. It is said that you three, contrary to the wise advice of your deceased parents, are dedicating part of your time to work! I also know that in your room you keep TTD lists. Yes! Don't try to deny it! I studied long ago the enemy's code, and I know the meaning: "Things to Do"… What are they for? Tell me, aren't they meant to prevent you from forgetting your obligations and even help you do more tasks? (…) To be honest, I didn't want to believe what my old ears were telling me, but unfortunately it was true (…) I don't know what went wrong in your education. That's why I decided to write to you so that it doesn't ever happen again (…) The first lesson you must learn: never do today what you can put off until tomorrow, or even the day after (*Testas para sempre 2002b*, p. 39).

Table 2. Summary of topics that can be worked on some sessions with Testas in 7th grade

N$_o$	**Topics**	**Strategies**
1	Phases SRL	Macro-strategies: planning, execution and evaluation (PE^2).
2	Personal commitment	PITL (PIlot To Learn) Care of the material studied.
3	SRL phases (planning and execution) Summary	"APAC" planning (Attack Plan against Asthma Crisis) Self-instructions. Steps in the development of a summary (reading, identifying, organizing)
8	External and internal distractors Causal attributions	Identifying and seeking solution alternatives. What do you usually do?
9	External and internal distractors. Causal attributions. Goals	Identifying and seeking solution alternatives. CREva objetives: Concrete, Realistic and Evaluable. Steps to achieve a goal: define, reflect, offer alternative, monitor, evaluate.
11	Problem solving Doing exams	Problem-solving strategies. Relaxation and breathing. Strategies to do exams.

Investigation

The data obtained thanks to the investigations carried out in Portugal and Spain (González-Pienda et al. 2014; Núñez et al. 2013; Rosário et al. 2010) show how *Testas' (mis)adventures* (Rosário 2002a, 2002b,2002c; 2003; 2004a; 2004b) is effective in promoting the use of self-regulated learning strategies. More specifically, the interventions have proven efficiency, in general, in improving the declarative knowledge of the self-regulated learning strategies; the use of these strategies in the academic tasks; the improvement of the self-efficacy and usefulness perception of said strategies; an increase in study time and, in some cases, an improved academic performance (González-Pienda et al. 2014; Núñez et al. 2013; Rosário et al. 2010). Also, it seems that the longer time dedicated to working with the student,

the bigger the size of the effect of the intervention (Nuñez et al. 2013). This can be especially useful for students who have or are at risk of having poor academic competences (González-Pienda et al. 2014).

LETTERS FROM GERVASE

Program Description

Following the line of previous programs, *Letters from Gervase* is an intervention program for the acquisition and improvement of self-regulated learning strategies oriented to higher education students through the voice of character who is a student living in a similar situation to their own.

Format and Contents

This program comprises a set of thirteen humorous letters written in the first person. Gervase and his belly button describe and reflect on their experiences and learning processes in the academic context, with a narrative structure that follows the self-regulatory cycle previously described. For example, an extract from the letter dedicated to work procrastination is presented thusly:

> *Letter nº4*
>
> *(…) – Do you know how to defeat "procrastination" of homework, Gervase?*
>
> Gervase: – Hello, Belly Button. I'm writing you because I don't really know what to do. I'm overwhelmed. Imagine what made me decide to write to you again. I have to present a five-page project on Monday and, as you know, there are only three days left. I guess I'm not going to make it, and the consequences will be tragic. The directions the professor gave us were minimal. To make my life even more complicated, the proposed topic is diffuse and wide ranging. I don't know where to start. Yes, yes, I know I should have started before, but even if you don't believe me, I tried. I simply believe that I'm not cut out to write projects.
>
> Belly Button: – Darling, I'm sorry to interrupt your stupidity. Your face is wet from tears and you look like an ostrich with the face buried in the sand (…) but I cannot take it any more…
>
> Gervase: – Belly Button?!
>
> Belly Button: – Of course, who do you think I am? Your kidney? (…) Excuse me, I'm not going to pity you. I'm worried about you (…). Here goes the first rule for every student, most of all for university student: you need to honestly assume the responsibility of your academic behavior.
>
> Gervase: – What?
>
> Belly Button: – It's clear that you won't always have the best teachers or the best studying conditions. This degree may not have been your first option, and your life might not be very easy. However, if you go on blaming teachers for your failures, the bus drivers for your delays, the Greenwich meridian for your alarm clock problems … you will never truly face the problems (…) Assigning the causes of our problems to other people or things can be good for your ego, but it delays the solution of the problems. You got a bad grade on the exam because "you weren't born to learn," because "the teacher falls asleep in class," because "no

one can read these textbooks," because "the books are written in …," because … could it be that, at least once, what's going on is your fault, because of your lack of organization? Maybe something could change if you faced the responsibility of your actions … don't you think?

Gervase: – What do you expect me to do?! I don't always study (…) (*Letters to Gervase, letter Nº 4*).

In order to make instructive work easier, each letter has a summary and a series of activities. The summaries systematize the contents and the self-regulated learning strategies seen in the different letters. The working suggestions that are presented and linked to each letter have a diversified character so that they meet the differentiated needs of the individual students and academic contexts (e.g., goal establishment, time management, tabs-keeping, anxiety in the face of exams, understanding memorization of the information strategies, etc.). This way, the final choice of the activities to be worked must be made regarding the different personal, instructive and culture restrictions of the group of students. Each letter can be worked within the independent sessions; the number and frequency of the sessions are not fixed, and the letters can be seen all together or a few at a time, being able to be distributed in the number of sessions esteemed (although it is not recommended to work less than six). In Table 3, a summary of the content and strategies to be handled can be observed. On the other hand, letters are written without a full stop, which forced the readers to engage in a metacognitive reading about the topic seen, as well as the need for appropriation of personal knowledge and studying and learning the routine reflected in them.

Table 3. Contents and strategies of some of the *Letters from Gervase*

Distribution of the letters of the project	**Contents and self-regulating strategies addressed**
Letter Nº1 *What does it mean, after all, adjusting to University life?*	Adaptation to university. Planning and time management.
Letter Nº2 *What are my goals? What really guides my actions at all levels, i.e., my studies, my University attendance, my hobbies, sport and relationship with others… and even my lassitude?*	Setting goals. Rules of goal setting (*CRAss).* Short-term and long-term goals. Study goals, and achievement goals.
Letter Nº4 *Do you know how to fight procrastination, Gervase?*	Time management. "To do" lists. Organizing the study environment. Procrastination. Relaxation techniques.
Letter Nº6 *Who rules your learning?* *How can one tell successful students apart?*	SRL. The cyclical model of SRL PLEE (PLanning, Execution, Evaluation). Setting goals. Monitoring. Motivation.
Letter Nº12 *What is Test Anxiety?* *How can one deal with Test Anxiety?*	Test anxiety. Aspects of anxiety (feelings and emotions). Internal and external distractors. Plagiarism and copy write. Relaxation techniques.

Investigation

The efficacy of *Letters from Gervase* has been analyzed on many occasions. It has been observed in some research that the program is efficient for the improvement of the declarative knowledge of the learning self-regulation strategies, the use of strategies, the improvement of the motivational variables and the decrease of a superficial focus on learning (Rosário et al. 2007c; Rosário et al. 2014; Rosário et al. 2010; Núñez et al. 2011). The results show some consistency even when contexts of application are very different, such as in other countries like Spain, Portugal, Mozambique or Chile (Rosário et al. 2015). These results are consistent when the program is in pen and paper and when implemented in another format, through CBLE´surroundings (Núñez et al. 2011).

CONCLUSION

Regardless their educational level, students must be able to autonomously and efficiently control their studying process. The explicit instruction of self-regulated learning strategies can be very useful to help them achieve this.

These programs are tools to guide both students and educators who are interested in promoting this kind of learning. These programs have shown their efficacy to improve the different variables related to the self-regulated learning process, such as the students' feeling of self-efficacy, the perceived usefulness of the strategies, the students' learning goal orientation, the increase in study time and even the academic performance in subjects such as Spanish and mathematics. However, the effects of the significant improvements in these variables tend to be moderate or low, which indicates the need to keep improving the tools, the instruction and the way in which the variables are measured.

It could be interesting to observe the programs efficacy, if they are integrated into the curriculum and into the educative centers, to value their transference to the ordinary activities of the classroom; and to assess the effects of having other kinds of measures and evaluating tools—not only on self-report questionnaires—on event and process measures, as well as other metrics (Greene and Azevedo 2009).

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Chapter 4

FROM ABILITY TO MULTIPLE INTELLIGENCES: IMPLICATIONS FOR ASSESSMENT AND INTERVENTION IN LEARNING DIFFICULTIES

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ABSTRACT

Intelligence can be considered one of the most studied and yet one of the most controversial constructs in the field of human learning. The study of intelligence has been approached from different models in an attempt to answer the question of whether intelligence is a unique ability that underlies and influences all the activities that people do, or whether it is an entity integrating different components or skills. While models are different, nowadays, it seems that multiple models are receiving more scientific interest, and this has implications both at the theoretical and practical levels. The goal of this chapter is to offer a description of the term intelligence and its evolution through the different theories and models, with special emphasis on Gardner's theory of multiple intelligences as an example of non-unitary intelligence models. The implications of this model in the assessment and intervention of students with Learning Difficulties (LD) are also addressed, suggesting new lines of work in this regard.

Keywords: ability, multiple intelligences, learning difficulties, evaluation and intervention.

INTRODUCTION

It is currently accepted that the human being is equipped with different abilities or skills, which do not occur with the same intensity or direction in everyone. Some people have an

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exquisite taste and good skills for music, others for dancing or the fine arts. In contrast, others stand out in math and science, or literature. Within this context, the contribution of Gardner (1983, 1999) and his multiple intelligences theory (MIT) is worth mentioning, a theory that is at odds with the concept of intelligence as a general or unitary ability. This chapter is intended to present a brief review of the concept of intelligence and its evolution, from the theories of ability to the perspective of multiple intelligences, to finally examine in depth this theory and its applicability in assessment and intervention in learning difficulties (LD) in the current educational and technological context.

Definition and Evolution of the Concept of Intelligence

To address the study of intelligence, it is important to review how the concept has evolved up to the present day. It is difficult to have a unique concept of intelligence, partly because of the theoretical, conceptual, and methodological problems that have surrounded its study throughout history.

Among the first attempts to define what intelligence is, we note the first definitions and models in which intelligence is linked to traditional conceptions of genius (Galton 1892). Galton placed special emphasis on demonstrating that intellectual capacity was inherited, while at the same time, he considered the relevance of intrinsic motivation and persistence as an important part of this definition.

After Galton's initial work, there have been frequent efforts to characterize this concept, giving rise to very different approaches. For example, from an evolutionary perspective, intelligence has been related to overcoming certain milestones in the process of the subject's development; from a differential perspective, the center of interest is located in the study of the hierarchical factors through which psychological tests have been elaborated; whereas from a procedural perspective, researchers tried to discover the components or processes that are responsible for intelligence (Vila 2011). On another hand, intelligence has also been approached from different models in an attempt to answer the question of whether intelligence is a unique ability that underlies and influences all the activities that people do, or whether it is an entity in which different components or capacities are integrated (Sampascual 2002).

Taking into account a psychometric perspective, there would be two ways of understanding the structure of intelligence: unitary and multifactorial. The first unitary or monolithic models of intelligence, like the model of mental age (Binet and Simon 1905), the IQ (Stern 1911) or the g factor model (Spearman 1927), contributed to improving the identification of intelligence. Along with these, we highlight the first scientific study carried out by Terman (1954), who discovered that the gifted, besides surpassing in intellectual aspects (he established the deviation IQ), also surpass in other areas, such as physical or psychosocial aspects.

In his model of general intelligence or g factor, Spearman (1927) conceived intelligence not only as a capacity to learn. He posited that each aptitude of a subject depends on a general factor (g) that influences intelligent activities, and a specific factor (s), different and independent, for each type of intelligent activity. In this way, the g factor would be considered the underlying and constant energy shared by all the intellectual activities, and the specific factors were unique and related to each cognitive activity.

However, the factorial models proposed the existence of multiple components of intelligence, which entails a proposal of the evaluation of intelligence based on multifactorial tests. For example, the model of primary mental aptitudes of Thurstone (1938) proposed breaking down the g factor into several subcomponents, such as verbal comprehension, verbal fluency, calculus, memory... In the structure of intellect model of Guilford (1967), different parameters of intellectual functioning were established such as contents, operations, and products. In fact, Guilford obtained up to 150 intelligence factors, which include creativity (composed of fluidity, flexibility, and originality of thought), divergent thinking, and social intelligence.

From other approaches, it has been considered that intelligence is organized hierarchically (Carroll 1993). These hierarchical approaches tend to combine the unitary nature of intelligence with factorial explanations, as they consider intelligence as a superordinate construct, and its factors as entities that are subordinate to the general structure. They include two models. First, Vernon's (1960) model establishes four levels of specificity, from higher to lower: g factor, group factors, minor group factors, and specific factors. Secondly, we highlight Cattell and Klins' (1982) model of fluid and crystallized intelligence. From an inheritance-environment interactionist perspective, they proposed an explanatory theory of the structure of intelligence considering that it is composed of two factors or types of intelligence: fluid intelligence and crystallized intelligence. In their model, they identified crystallized intelligence as a result of the interaction of individual abilities and culture, whereas the subject's skills and abilities were associated with learning experiences and directly related to specific task demands and the subject's previous experience with the task. On another hand, they identified fluid intelligence with the capacity to flexibly adapt one's thinking to new problems or situations, free from cultural influences, without requiring experience or prior learning and independent of the content and specific task domain.

Gardner (1983) also recommended a new definition of intelligence, in which he proposed the idea of multiple intelligences (MI). For this author, intelligence has great social and adaptive power. According to him, people have different cognitive potentials, which are developed in a particular socio-cultural context and in a particular environment. Therefore, Gardner will refer to seven types of intelligence: musical, linguistic, bodily, logical-mathematical, visual-spatial, intrapersonal, and interpersonal. In subsequent studies, he reformulated his theory by adding two more intelligences: naturalistic and existential (Gardner 2013).

Sternberg (1986, 1990), through his triarchic-cognitive theory, examined the processes and outcomes of intelligent behavior. From the cognitive perspective, he attempted to explain intelligence in terms of basic processing abilities, strategies, metacognition, and knowledge. His triarchic theory is established in three areas of interaction with the real world.

- The first area is the componential subtheory (intelligence and real-world). This refers to the mental processes that underlie intelligent behavior regardless of the context and the components (meta-components or executive processes; execution components, which execute the orders of the meta-components; and components of acquisition of knowledge).
- The second area is the experiential subtheory (intelligence and experience).
- The third area is the contextual subtheory (intelligence and the surrounding world).

For this purpose, Sternberg, proposed classifying people as analytical (they have high test intelligence, without practical intelligence), synthetic (they do not score high in ability tests, but are creative and make significant contributions to society), and practical (they apply analytic and synthetic skills to everyday life).

As can be deduced from these lines, the definitions of intelligence, as well as the theories from which it has been studied, stand out because of their diversity. However, current theories in this regard emphasize the presence of several skills or abilities within this construct. Within this perspective, we will focus on the MIT in the next pages, as this is one of the theories that has produced a greater number of investigations in recent decades.

Theories of Intelligence: The Theory of Multiple Intelligences (MIT)

Within these pluralist theories of the mind is the theory of multiple intelligences (MI) of Howard Gardner. This theory posits that intelligence consists of a set of skills, talents or abilities, independent of each other, which he calls intelligences and which are potentially found in everyone (Gardner 2013), although each individual has a unique profile of intelligences, which means that "although we are all born with these intelligences, there are no two people who have exactly the same ones and in the same combinations" (Gardner 2012, 65). According to these ideas, Gardner (2012) defines intelligence as "a biopsychological potential to process information that can be activated within a cultural framework to solve problems or create products that have value for a culture" (p. 52). At first, Gardner identified seven intelligences: linguistic, logical-mathematical, musical, interpersonal and intrapersonal, visual-spatial, and bodily-kinesthetic. Later on, he incorporated naturalist intelligence to his theory (Gardner 2012). Linguistic intelligence represents the ability to effectively use words, written or oral; logical-mathematical intelligence is defined as the ability to reason and use numbers effectively; musical intelligence is the ability to perceive, discriminate, transform, and express musical forms; intrapersonal and interpersonal intelligences are the skills that represent individuals' social competence, their ability to behave adaptively based on their own self-knowledge, and the ability to perceive and distinguish the intentions, motivations and feelings of other people; visual-spatial intelligence is defined as the ability to perceive the visual-spatial world accurately as well as to perform transformations on these perceptions; and bodily-kinesthetic intelligence is the body's ability to express ideas and feelings, and to use one's hands to transform things. Regarding naturalist intelligence, this represents the ability to observe patterns in the operating systems of Nature and to identify and classify objects (Chan 2004).

It is important to note that Gardner not only identified these types of intelligence, but that he equated all of them to the linguistic and mathematical intelligences, which till now had been considered as the key to determine a subject's intelligence and were the only ones that were taken as a reference in the traditional tests (Armstrong 1999; Ferrándiz 2000; Gardner 2013; Gomis 2007; Hernández-Torrano et al. 2014). From the MIT, it is proposed that intelligence is not due to a unitary, static ability, and that it cannot be reduced to a number (the intelligence quotient or IQ), stressing that all these intelligences are present in everyone, but in different degrees or intensities. Each of them has different neurological bases, located in different brain areas. These intelligences interact with each other, and when we perform

any activity, several of them participate. Each individual can enhance them with strategies and relevant aids.

To justify the existence of these intelligences, Gardner refers both to biological and evolutionary criteria (Álvarez et al. 2007). From the biological point of view: the possibility that intelligence can be isolated in cases of brain injury (lost or preserved skills after an accident or injury) and the differential origin of intelligence as a function of the evolutionary process of human beings and other species. From the point of view of developmental psychology: the different developmental path of each intelligence and the existence of child prodigies and the so-called "idiot sages or savants". Prodigies demonstrate exceptional skills at a very young age in certain areas (in music, mathematics, chess, etc.) whereas in other areas, they do not (they may even sometimes show deficits). The savants, for their part, are people with a low IQ who, in a certain area, exhibit surprising skills. For example, they are capable of remembering quickly and accurately a certain date or doing mathematical calculations that are unthinkable for the rest of us, but they are incapable of solving simple everyday problems or relating to other people.

In this respect, it is important to note the highly practical aspect of this theory. Gardner himself says that these skills are useful to solve problems and create useful products for society, which is why certain relationships can be established between a person's MI profile and his or her subsequent career.

Table 1 briefly describes each of the components of the MI initially proposed by Gardner (remember, Naturalist intelligence was not included in the model until 2012). It also shows the evolution of these components from the biological and developmental point of view, and their practical use in our society.

Table 1. Description of Garnder's multiple intelligences

Intelligence	Neurological system	Central aspects	Developmental factors	Cultural value	Final product
Linguistic	Left Temporal and frontal lobe Broca/Wernike	Sensitivity to sounds. Structure, meaning and functions of language.	Emerges in early childhood. Existing in old age.	Literature, narrations, stories	Writer Speaker
Logical-mathematical	Left parietal lobe Right hemisphere	Sensitivity and ability to discern logical or numeric patterns. Reasoning.	Peaks at adolescence. Declines at age 40	Scientific discoveries, Mathematical theories	Mathematician Scientist
Spatial	Posterior regions Right hemisphere	Ability to accurately perceive visual-spatial aspects	Topological thinking. Artistic eye. Existing in old age.	Articulated work, Architecture. Navigation	Architect Artist

Table 1. (Continued)

Intelligence	Neurological system	Central aspects	Developmental factors	Cultural value	Final product
Bodily kinesthetic	Cerebellum Motor cortex	Ability to control movements and improve objects	It varies depending on strength, flexibility or area.	Athletics, dramatic exercises, Dancing	Athlete Dancer
Musical	Right temporal lobe	Ability to produce and appreciate rhythm, tone, timbre and musical forms	Early development. Child prodigies.	Musical compositions	Composer Director
Interpersonal	Frontal lobe Temporal lobe Limbic system	Ability to discern and respond to the feelings and motivations of others	Attachment first 3 years	Political, Institutional, social documents	Leader counselor
Intrapersonal	Frontal lobe Temporal lobe	Ability to access and discriminate one's own feelings and emotions	Self-other distinction. First 3 years.	Religious systems, psychological treatments	Psychotherapist Leader

Applicability of the MIT in Assessment and Intervention in Learning Difficulties

The term learning difficulties (LD) refers to a heterogeneous group of disorders that are manifested in significant difficulties for the acquisition and use of listening, speaking, reading, writing, reasoning, or math skills (National Joint Committee on Learning Disabilities 1998). The Diagnostic and Statistical Manual of Mental Disorders-fifth edition (APA 2013), the referent for professional practice and research in Psychology and Psychiatry, includes writing difficulties and those related to reading, calculus, and unspecified difficulties under the category of Specific Learning Disorders. These disorders are considered as intrinsic to the individual, assumed to be due to a dysfunction of the central nervous system and they can occur throughout the life cycle. However, extrinsic circumstances, arising from the individual's context, as well as improper instruction or the presence of other co-morbid conditions can be highly influential in the diagnosis and course of LD (García et al. 2013; Rodríguez et al. 2015).

Within the current normative framework in Spain, the Organic Law for the Improvement of Educational Quality (LOMCE) includes students with within the group of the so-called Specific Needs for Educational Support (in Spanish, "Necesidades Específicas de Apoyo Educativo" - NEAE) under the term of Students with specific learning difficulties (Title II, Chapter I, Section four). This normative emphasizes the need for the identification, assessment, and intervention of students with LD as soon as possible. Regarding the first point, that is, the identification of students with LD, the new law incorporates the novelty of individualized assessment of the students at the end of the third year of Primary Education, specifically focused on the degree of acquisition of competence in linguistic communication and mathematics. This is a positive change from the previous regulations (LOE - Organic Education Act of 2006), as it advances this type of evaluation by one course and focuses it specifically on linguistic communication and mathematical competences. However, increasingly more empirical works emerge that suggest the need for an even earlier diagnosis, prior to this age, during which some basic aspects of the mechanics of these learnings should be acquired (Villagrá-Arnedo et al. 2015). As for intervention in LD, the LOMCE maintains attention to diversity through curricular and organizational measures as a fundamental principle. In the case of Primary Education, this refers to the implementation of reinforcement mechanisms as soon as such difficulties are detected, such as support measures in the regular group, flexible groupings, or adaptations of the curriculum and, exceptionally in the case of repeating students, specific plans of reinforcement or recovery. Despite these efforts, the data from international studies, such as the well known studies of OECD- Organization for Economic Cooperation and Development (2012), indicate the presence of lower school performance in our students in basic areas such as Math, reading and Science, in comparison with other countries members of the OECD. These findings suggest the need to incorporate new, empirically proven, and validated strategies in our population—which would be a good complement to the different mechanisms of identification, reinforcement, and support for students with LD—to those we currently have, thus helping to prevent or palliate LD and its consequences.

The MIT has important educational implications, insofar as these talents and skills provide information about students' preferences and learning styles and also, their strengths. This is an essential element in the current educational context and even more so in the context of LD and associated problems, involving a radical change of perspective, rejecting deficit-based models in favour of a model based on students' different skills or strengths (Al-Onizat 2016; Andreou, Vlachos and Stavroussi 2013). Rose and Meyer (2002) point out in this regard that students have different learning abilities that are expressed in many facets, and that deficits in a specific area can be compensated for by strengths in other areas.

On anther hand, these intelligences are measurable and can be observed in different contexts of daily life, mainly in the classroom (Al-Salameh 2012). In fact, there are increasingly more teachers who recognize that students learn and excel in a broad variety of ways, and that the teaching-learning processes will be enhanced to the extent that we can identify students' strengths in these intelligences. A classroom that offers a variety of opportunities for learning increases the students' probability of success (Andreou et al. 2013; Kornhaber 2004).

MIT and Evaluation in LD

In the context of evaluation, there are several studies that show the presence of different MI profiles in students with and without LD, or with different problems, like Attention Deficit Hyperactivity Disorder (ADHD), although reading difficulties is one of the areas that has been studied the most to date. An example is the study carried out by Andreou et al. (2013) with students of the first grades of Secondary School. These authors compared 117 students (39 with dyslexia and 78 controls) in different measures of MI, finding better visual-spatial skills but worse linguistic skills in the group with dyslexia. These results are consistent with previous studies that indicate a higher preference in dyslexic people for the use of visual-spatial and bodily-kinesthetic skills (Exeley 2003; Lisley 2007), supporting the hypothesis of the linguistic or verbal nature of the difficulties in this area, and the superiority of dyslexic students in the representation and conceptualization of visual information (Attree, Turner and Cowell 2009; Bacon, Handley and McDonald 2007). Similarly, Tafti, Heidarzadeh, and Khademi (2014) found differences between students with and without LD (mathematics, reading, and writing) in linguistic, logical-mathematical, and interpersonal intelligence, with better skills in the group without LD. In the case of ADHD, the studies are scarcer, but they show certain differences in the MI profile. In this sense, Schirduan (2000) and Schirduan and Case (2004) found a greater predisposition of students with ADHD towards naturalistic and visual-spatial intelligence compared with linguistic and logical-mathematical intelligence. Further research in this area is therefore necessary.

MIT and Intervention in LD

Regarding the area of intervention, at present, the study of MI is proving to be quite a promising field of research. Many authors are adopting this perspective as a way of incorporating alternatives to improve the acquisition of language, reading, or mathematics, as well as of basic skills to control behavior and attentional processes, with positive results (especially relevant in the context of ADHD) (Abdulkader, Gundogdu and Eissa 2009; Al-Onizat 2016; Andreou et al. 2013; Takahashi 2013). MI-based interventions have been found to improve motivation, self-concept, self-efficacy and overall academic performance in students of different ages with and without LD (Drakeford 2010; Glenn 2010). Specifically, Al-Zyoud and Nemrawi (2014) examined the effect of MI-based instruction in a sample of fourth-graders with LD in mathematics, finding improvements in academic performance and academic self-concept. Nezhad et al. (2015) found improvements in the same variables in students with reading difficulties, whereas Abdulkader et al. (2009) showed the greater effectiveness of an MI-based intervention in reading comprehension and word recognition in students with LD in reading, compared with traditional teaching methods.

CONCLUSIONS AND FUTURE LINES OF RESEARCH: THE ROLE OF NEW TECHNOLOGIES

Just as the definition of intellectual capacity has been approached from different models and has evolved to more flexible and comprehensive perspectives, the field of LD has also undergone changes in recent decades. Together with the changes occurring in our society, it is necessary to remember that, like the rest of individuals, students with LD have unique

characteristics, interests, and needs when it comes to learning. The current paradigm of education advocates focusing on the person and considering these individual differences. In this sense, it is necessary to develop learning systems and contexts adapted to these characteristics. As a whole, the previous studies provide empirical evidence of the usefulness of an MIT-based approach to the assessment and intervention in LD, although they also point to the need for further research in this field. In this sense, evaluation and intervention based on this theory could highly benefit from another of the pillars of our current society: the new technologies, specifically, the hypermedia tools.

The benefits of this type of tools have been shown in different studies of students with LD. Thus, the use of these systems has been shown to have a positive effect on the acquisition of reading skills (Coleman-Marin et al. 2005; Luckevich 2008), vocabulary, language, and listening skills (Massaro and Bosseler 2006), the treatment of dysgraphia (Polat, Adiguzel and Akgun 2012), and in learning mathematics (Andrade-Aréchiga, López and López-Morteo 2012; Butterworth and Laurillard 2010; Cueli et al. 2016). One explanation for these results is linked to the characteristics of the hypermedia tools, which facilitate receiving the information from multiple channels. Thus, if one channel is not attended, the information can be captured by other channels instead of being lost. In other words, the presentation of information through multiple channels increases the likelihood that relevant information will be attended (Fabio and Antonetti 2012).

This is because, compared to the traditional educational tools, hypermedia systems have the advantage of presenting the contents in a variety of formats (written texts, images, animations, sounds, etc.) (Mayer 2005). That is, in this kind of tools, images, sounds, text and other forms of presentation of information are simultaneously present, so they have the ability to activate auditory/verbal and visual channels at the same time. In addition, working in this type of environments provides learners with greater control of their learning processes, such as, for example, allowing them to choose a certain sequence.

These features open up a world of possibilities to develop different skills, which can turn these channels into important mediators for MI-based intervention, thus clearing the way for an important line of research in the future.

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Chapter 5

USING METACOGNITIVE SCAFFOLDING TO DEVELOP PROBLEM SOLVING SKILLS IN K-12 COMPUTER-BASED LEARNING ENVIRONMENTS

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ABSTRACT

While highly desirable in work environments, problem-solving skills are often underdeveloped, largely due to the lack of instructional opportunities in school curriculums to develop such skills. Current educational standards now emphasize problem-solving skills, however educators have been provided with little information and few tools to develop these skills within meaningful problem-based learning contexts. Computer-based learning environments (CBLEs) hold great promise for developing problem-solving skills given their ability to provide metacognitive scaffolds to assist in the problem-solving process. Metacognitive scaffolding prompts provided over time can aid learners in building both problem solving skills as well as conditional knowledge for future problem solving. Scaffolding can then be faded to encourage the continued independent use of strategies and potentially increase the likelihood of transferring these skills to future problem-solving experiences. Further, CBLEs can be tailored to individual learners ensuring each learner receives appropriate instruction and fading based on their own skills levels. The purpose of this chapter is to overview the current understanding of approaches to teaching problem-solving within CBLEs for upper elementary school students and also to provide suggestions for advancing the research forward.

Keywords: metacognition, problem solving, instruction, CBLEs

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INTRODUCTION

While the ultimate goal of education is arguably to help students develop flexible knowledge and strategies that transfer to new contexts (Mayer and Wittrock 2006; Phye 2001; Spiro, Coulson, Feltovich and Anderson 1988), traditional instruction and assessment, all too often, places greater emphasis on rote memorization than application and problem solving (Anderson 2012; Taconis et al. 2002). School curricula lack opportunities for students to develop real world problem solving skills (Greiff et al. 2013; Jonassen 1997, 2000; Mayer and Wittrock 2006) instead opting to emphasize content knowledge acquisition for testing purposes (Anderson 2012). The Next Generation Science Standards (NGSS 2013) emphasize the importance of learning through inquiry and using the engineering design process to solve everyday problems. Both inquiry learning and design processes provide students opportunities to struggle with complex problems in order to learn and improve their problem solving skills.

Students' problem-solving skills often suffer for a number of reasons including lack of formal instruction on effective problem solving and metacognition, and also a curricular overreliance on well-structured problems. Despite models of instruction emphasizing problem solving during learning and assessment, (Jonassen and Hernandez-Serrano 2002), many instructors expect students to independently apply content knowledge to problem solving without instruction on how to do so. Direct instruction and modeling of problem-solving skills is necessary for students to acquire problem-solving skills (Mayer and Wittrock 2006). King's (1991) research showed that teaching students problem-solving strategies, such as guided questioning, led to an increased ability to solve problems. Fifth grade students who received problem solving training outperformed their peers on new problem solving tasks, more effectively communicated through questioning and explanation techniques, and demonstrated improved problem-solving abilities. Science and math classes typically focus on quantitative, well-structured problem solving with a single correct answer and solution path (Sinatra and Taasoobshirazi 2011).

However, this quantitative problem solving does not translate to conceptual understanding or conceptual problem solving (Mualem and Eylon 2010). Alternatively, allowing students to engage in meaningful problem solving can help students discover errors in their knowledge, address misconceptions, and engage in conceptual change (Mayer 2013). Meaningful, challenging problem solving will not only improve students' content knowledge (Sinatra and Taasoobshirazi 2011), but will also improve their problem-solving skills for the future (Hartman 2001b). Engaging in challenging problem-solving experiences can be initially overwhelming for students, but proper supports can be used to assist them in the process. Computer-based learning environments can be used to scaffold students through these difficult tasks and provide appropriate support as needed.

The purpose of this chapter is to overview the current understanding of metacognitive scaffolding approaches to teaching problem solving within computer-based learning environments (CBLEs) for upper elementary school students and also to provide suggestions for advancing the research forward. We begin by defining the problem-solving process by introducing a heuristic model to guide instructional practice. Next, a summary of prior research related to metacognitive skills and scaffolds for problem solving in CBLEs will be provided. Then we profile research on one particular CBLE that focuses on both scaffolding

and metacognition. The chapter concludes with suggestions for moving forward in the development of CBLEs that effectively guide the development of elementary students' problem-solving skills.

Defining the Problem-Solving Process

Problem solving, as defined by Mayer and Wittrock (2006), is the goal directed cognitive process individuals engage in when they have no obvious solution to an encountered problem. According to Chi and Glaser (1985), two main factors affect problem solving, the nature of the problem-solving task and the knowledge of the problem solver. Individual differences such as prior problem-solving experience, domain knowledge, metacognitive knowledge, and motivation for problem-solving play important roles in problem-solving processes and success (Mayer 2013). The complexity of the problem-solving process requires problem solvers to have effective heuristic approaches to meet the demands of the task and that apply across contexts.

Research in problem solving is evolving quickly, yet is fundamentally grounded by a common model articulated many years ago by the mathematician George Polya (1945). Polya set forth a basic general problem-solving model that included four steps: 1) understand the problem, 2) devise a plan, 3) carry out the plan, and 4) review your process. The bulk of contemporary research in problem solving still employs these basic steps or some variation of them in their designs. We argue here that one of the most important goals for teaching problem solving is to have the learners internalize the fundamental steps of such a model given its flexibility and use across in multiple scenarios and contexts. A brief description of the steps of the general problem-solving model follow below.

Understand the Problem: In the initial stage of problem solving, the problem solver clarifies the problem that needs to be solved by identifying the initial and goal states of the problem (Chi and Glaser 1985; Davies 2005; Jonassen 1997, 2000; Mayer 2013; Newell and Simon 1972). Additionally, constraints that impact moving from the initial to goal state are identified. During this step, younger problem solvers benefit from creating external representations of the problem through drawings or diagrams. This process relieves strain on learners' working memory, allowing them to focus on solving the problem. Additionally, this step encourages the problem solver to evaluate the structure of the problem, making connections to previously solved problems and improving efficiency.

Devise a Plan: Once the problem solver has clearly defined the problem and constraints, they can focus on how to solve the problem. Students can be taught several key strategies for solving a problem once they have identified the type of problem. These strategies can be either domain specific, such as mathematical procedures, or domain general such as research procedures. Selecting the appropriate approach to solving the problem hinges on students thoroughly understanding the problem in the initial step.

Carry out the Plan: Implementation of the problem-solving plan is generally straight forward, but requires the problem solver to switch strategies when the plan is not working. Students need to trouble shoot as they implement their plan to ensure they reach the best solution.

Review Your Process: After reaching the solution, problem solvers must check their solution to be sure it meets the parameters of the problem. It is also important that the

problem solvers review the process they used to solve the problem to inform future problem solving.

Types of Problems

Problems have been categorized into three major groups, puzzle problems, well-structured problems, and ill-structured problems, depending on several factors including the extent to which problems are well-defined, the number of available solutions and solution paths, and the context (Jonassen 1997). Psychological research into problem-solving processes has relied heavily on puzzle problems (i.e., Tower of Hanoi, Nine Dots, Missionaries and Cannibals). Puzzles are context-free problems with a single correct answer and usually a single preferred solution path. Puzzle problems generally have a well-defined initial state, goal state, and set of constraints, allowing the solver to focus on the operators (steps employed to move from the initial to goal state). While these problems have been useful in understanding how people search for solutions to problems and produce generalizable results, they are not tied to school or real world practices (Chi and Glaser 1985; Jonassen 1997). Further, examining problem-solving processes without considering the role of prior knowledge does not fully represent the processes that occur during well and ill-structured problem solving. This limits the applicability of research results from these studies, especially in instructional fields looking to improve students' problem-solving skills.

Problems that are more realistic and represent what students and adults actually encounter are categorized as either well- structured or ill- structured problems (Chi and Glaser 1985; Jonassen 1997; Mayer 2013; Mayer and Wittrock 2006). Well- structured problems have clearly defined initial states, goal states, and operators that move the problem to its solution. Well- structured problems are often encountered in math classes where students apply practiced operators to move the problem from the initial to goal state. Well-structured problems are more context-dependent than puzzles because their solution typically requires the problem solver to have domain specific knowledge, such as knowledge of mathematical formulas and operations. Ill-structured problems, on the other hand, have poorly defined components, making the solution more difficult to reach. Ill-structured problems are more representative of real-world scenarios that are encountered on a daily basis since they are heavily context dependent and have multiple possible solutions.

Well and ill-structured problem categories are not discrete. Depending on the information provided about the problem, the number of solutions, the number of solution paths, and the context, problems fall somewhere on a continuum between well and ill-structured (Jonassen 1997). For example, well-structured problems tend to have a single correct answer, while ill-structured problems can have multiple solutions that need to be weighed against one another to determine the best course of action. The initial state, goal state, and constraints can be defined in varying levels, changing the problem from one with a prescribed set of operators to move from the initial to goal state (well-defined), to one with no established procedures for reaching the vague goal (ill-defined). Some problems do not clearly fit into a single category, as discussed by Jonassen, and instead possess features characteristic of both sides of the continuum (for a more detailed classification of problem types see Jonassen 2000). Buying a car, for instance, can have a specific goal with defined parameters, but the methods for making the final selection are unclear.

It's essential for school-aged learners to solve ill-structured problems rather than simply focusing on well-structured mathematical problems. While well-structured problem solving allows learners to practice applying strategies and procedures they have already learned, ill-structured problems challenge them to extend and use this knowledge in new ways. Ill-structured problem-solving experiences assist students in building content knowledge as well as problem-solving skills that can be transferred to new problems. While learners solve the problems they are also applying this knowledge to real-world scenario, which builds deep conceptual understanding of challenging content. Incorporating ill-structured problem-solving experiences into the curriculum will teach students to apply their knowledge and solve challenging problems in the future.

THE ROLE OF METACOGNITION ON PROBLEM SOLVING IN COMPUTER-BASED LEARNING ENVIRONMENTS (CBLE)

Implementation of the general problem-solving model described above is largely dependent upon the metacognitive knowledge and skills of the learner. Metacognition has been loosely defined as thinking about thinking or knowledge of one's own cognitive processes (Flavell 1979; McCormick 2003). Metacognition consists of two major components: knowledge of cognition and regulation of cognition (Brown 1987; McCormick 2003; Schraw and Moshman 1995). Knowledge of cognition can be separated into declarative, procedural and conditional knowledge about one's thinking. While declarative knowledge refers to knowledge about the factors that influence performance, procedural knowledge describes knowledge about how to actually perform certain procedures. Conditional knowledge is knowledge of when and why to apply various strategies and procedures. It is crucial for learners to have adequate declarative, procedural and conditional knowledge in order to independently select, apply, and switch strategies as needed.

The second major component of metacognition, regulation of cognition, includes key skills such as planning, monitoring and evaluation (Schraw and Moshman 1995). During planning, learners select the appropriate strategies for their learning goals and allocate the needed resources. While engaged in a task, learners must simultaneously monitor their progress towards their goals to make adjustments and shift strategies as needed. Evaluating the cognitive processes applied and the results of the task is helpful for improving learning as well as the metacognitive knowledge that can be applied in future learning events.

Metacognitive knowledge and skills are important for learning (Hacker et al. 2009; Hartman 2001; Schraw 2001; Pressley and Gaskins 2006). Higher levels of metacognition have been linked to higher levels of reading comprehension (Pressley and Gaskins 2006; Thiede, Anderson and Therriault 2003; Williams and Atkins 2009), improved writing (Hacker et al. 2009), improved problem solving (Bernardi-Coletta 1995; Fortunato et al. 1991; King 1991; Swanson 1990), and overall higher achievement (Hartman 2001). Metacognition is also an important component of critical thinking (Ku and Ho 2010) and is necessary for students to learn from inquiry (White, Frederiksen and Collins 2009). Metacognitive knowledge can be improved with explicit modeling of strategies including information on how, when, and why to use them (Schraw 2001).

Metacognitive knowledge, particularly strategic knowledge, increases once children enter school (Neuenhaus et al. 2011). However, children do not readily transfer these strategies to new domains and contexts (Lyons and Ghetti 2010), but this ability can be improved with the proper instruction focusing on conditional knowledge (Neuenhaus et al. 2011; Pressley and Gaskins 2006; Schraw 2001). Improving children's metacognitive regulation relies on instruction, modeling, and practice. Explicitly focusing on conditional knowledge helps learners generalize strategies and apply them in new situations. Student reflection can be used during cognitive skill instruction to assist students' reflection on the essential pieces of conditional knowledge for each strategy (how, when, and why to use each strategy) and a regulatory checklist can remind students to plan, monitor, and evaluate their strategies while learning (Schraw 2001). Engaging in these regulatory processes prompts students to access previously learned material and strategies and to transfer their use to new situations while simultaneously increasing their metacognitive knowledge (Bransford et al. 1986; Hartman 2001).

Metacognition in Problem Solving

Currently, problem solving in schools is largely restricted to well-structured as opposed to ill-structured problems. Students are generally successful at retaining and applying algorithms, but they struggle when asked to transfer strategies to non-routine problems (Mayer 2001). Improving childrens' problem solving requires students to evaluate the strategies they are applying and subsequently to make adjustments to their problem-solving approach. Delclos and Harrington (1991) examined problem solving in Rocky's Boots, a computer-based problem-solving game, and found that students who monitored and reflected upon their problem-solving process had improved problem-solving performance. Additionally, these students were more likely to transfer their newly learned problem-solving strategies to new problems. If students are not taught to monitor and control their problem-solving processes they will likely not transfer skills to unfamiliar contexts (Pressley and Harris 2006).

While Delclos and Harrington (1991) examined well-structured problem solving, Ge and Land (2004) emphasized the importance of metacognitive knowledge to help learners solve ill-structured problems. Because ill-structured problem solutions seldom rely on the application of previously learned formulas, problem solvers can benefit from general problem-solving scaffolding. Ge and Land's (2004) framework for scaffolding ill-structured problem solving relies on metacognitive planning, monitoring, and evaluating while helping problem solvers find and assess solutions to the problem. Additionally, the scaffolding requires the problem solver to access metacognitive knowledge from previous problems and build additional knowledge for future problems.

Research has shown that experts are better problem solvers in their domains due to strategic knowledge rather than simply content knowledge (Schunn, McGregor and Saner 2005). Experts' conditional metacognitive knowledge of strategies helps them easily select and apply the most appropriate strategy to reach a problem solution. Metacognitive skills are quite useful because they can assist children in compensating, to some extent, for deficits in content knowledge when solving ill-structured problems. For instance, Chen and Bradshaw (2007) used metacognitive scaffolds to promote knowledge integration during ill-structured

problem solving. The scaffolds reminded participants to reflect on their related prior knowledge in order to build a better problem representation. This scaffolding can help children search for useful strategies from other domains and apply them to the new problem. Engaging in this practice can also create a disposition in children to transfer strategies in future non-routine or ill-structured problem-solving scenarios.

Metacognitive Scaffolding in CBLEs

Scaffolding prompts can lead students to reflect on the how, when, and why of strategies. Metacognitive scaffolding also provides a model of the processes learners should engage in during learning. The goal of this modeling and reflection is for students to internalize these metacognitive processes and to gradually improve their metacognitive skills (Hoffman and Spatariu 2008).

Numerous studies have combined metacognitive scaffolding with CBLEs to improve content learning, cognitive skill learning, and general metacognitive knowledge and processes (Desoete, Roeyers and De Clercq 2003; Ge and Land 2003; Hoffman and Spatariu 2008). For instance, in the Delclos and Harrington (1991) study, the students who completed the prompts before, during, and after each game solved more complex problems in less time than students without the metacognitive prompts. Chen and Bradshaw (2007) also found that college students solving real-world, ill-structured problems performed better when presented with prompts to reflect on and integrate their prior knowledge. These metacognitive prompts facilitated intentional reflection to construct integrated problem representations and identify superior problem solutions. Bulu and Pederson (2010) found that domain-general (metacognitive) prompts lead to improved monitoring and evaluation, and facilitated sixth-grade students' transfer problem-solving skills when prompts were faded.

The use of question prompts as scaffolds for students' problem-solving processes are frequently employed in CBLEs to encourage general metacognitive processes that are important in solving ill-structured problems (Bulu and Pederson 2010; Chen and Bradshaw 2007; Chen and Ge 2006; Davis 2000; Delclos and Harrington 1991; Ge and Land 2003, 2004; King 1991; King and Rosenshine 1993). Question prompts are instructional supports that can focus the problem solver's attention on the appropriate features of the problem-solving process to help them develop skills and integrate knowledge (Davis 2000; King 1991; King and Rosenshine 1993; Scardamalia and Bereiter 1994). Problem-solving scaffolds aid students in solving problems that might be too difficult for them without support. As discussed by Vygotsky (1978), support provided from a more knowledgeable person aids students in moving from their current level of understanding to the next level. Question prompts can scaffold students working in the zone of proximal development (ZPD) by providing the necessary support for students to learn to solve the problems independently. These scaffolds can potentially improve students' problem-solving skill acquisition and transfer.

CBLEs can be designed to provide immediate feedback to students while learning to help them adjust and correct their learning and strategies. Roll et al. (2011) provided immediate metacognitive feedback to geometry students studying within a computer-based intelligent tutoring system. The feedback was designed to help students evaluate their help-seeking strategies (asking the program for hints while solving problems) while working in the

program. Each problem contained several hints that became consecutively more specific until the final, or bottom-out hint, provided the exact directions for solving the problem. Students were able to ask for as many hints as needed while solving the problem. Results showed that metacognitive feedback lead to fewer bottom-out hints during problem solving. Saadwi et al. (2010) found that immediate performance feedback in a medical tutoring program led to higher metacognitive performance as measured by the accuracy of participants' judgments of learning. However, once the feedback was removed, the improved performance was not maintained. It appears that the feedback provided by Saadawi et al. (2010) did not lead participants to reflect on their processes, but was instead a crutch that only temporarily helped students learning. Computer provided feedback, while convenient, must also be designed to initiate reflection that assists in the development of metacognitive knowledge.

Having students make frequent judgments of their performance or perceived ability is another approach for promoting metacognitive skills and improved problem solving in CBLE's (Winne and Nesbit 2009). Requiring students to make metacognitive judgments encourages progress monitoring and reflection on strategy use, providing an opportunity to regulate and improve performance. With regular practice, students can adopt monitoring processes to improve their metacognition. In addition, having students provide explanations for their judgments may facilitate learners in identifying the basis of their judgment thereby improving their metacognitive knowledge (Jacobse and Harskamp 2012).

In order to improve metacognition, computer-based interventions must engage learners in meaningful processes rather than superficial activities. Winne and Nesbit (2009) noted that computer programs can facilitate metacomprehension, but only if learners self-assess their understanding and strategies throughout the learning experience. As discussed above, some computer-based metacognitive supports do not help students. It is important that the instructional supports within the computer program are aligned with the specific metacognitive processes targeted by the intervention. It is also critical that interventions explicitly model the metacognitive processes and provide students with opportunities to practice and reflect on the skills.

Some CBLE's such as MetaTutor (Azevedo et al. 2010) and gStudy (Perry and Winne 2006) have been designed to provide more intelligent, personalized, and adaptive scaffolding to support metacognition and learning. Azevedo et al. (2012) developed pedagogical agents within MetaTutor, a hypermedia learning environment, that prompt users to apply different metacognitive processes and provide immediate feedback on their strategy use. Participants receiving prompts and feedback learned more efficiently than those receiving only prompts or no prompts. Intelligent, adaptive tutors, like those in MetaTutor, are able to provide instructive, just-in-time help to learners, and fade away as learners acquire metacognitive skills and apply them independently. This kind of individualized support is quite expensive and time intensive to create, which is why relatively few programs are currently using these supports in their programs.

Bulu and Pederson (2010) examined the impact of continuous and faded questions prompts with either domain-specific or domain-general content. Results of their study with sixth graders playing *Alien Rescue*, a problem-based CBLE that presents ill-structured problems related to the solar system, indicated that continuous domain-specific scaffolds improved content knowledge and problem representation. However, when faded, the domain-specific scaffolds were not transferred to new problem scenarios. The domain-general prompts helped participants develop solutions, make justifications and monitor and evaluate

their problem solving. Moreover, the domain-general scaffolds transferred to new problems when faded. Additional studies have shown benefits of scaffolding in problem solving, but have not examined transfer of these skills (Chen and Bradshaw 2007; Davis 2003; Ge and Land 2003; Ge, Chen and Davis 2005).

In another study, Bulu and Petersen (2012) had sixth-graders play *Alien Rescue* over 13 class sessions in four different scaffolding conditions: domain-general continuous, domain-general-faded, domain-specific continuous, and domain-specific faded. Their findings indicated the need to customize feedback based upon the prior knowledge and self-reported metacognitive skills. In general, students with low prior knowledge and low metacognitive skills benefited from both the domain-general and domain-specific scaffolding conditions whereas the scaffolding conditions had little impact on the performance of students with high prior knowledge and high metacognitive skills. Thus, it is important to consider how scaffolds will be presented in a program – requiring the use of them may lead to the expertise-reversal effect (Kalyuga et al. 2003) negatively impacting proficient learners. Relatedly, Kramarski and Friedman (2014) found advantages for solicited metacognitive prompts over unsolicited or no prompt conditions in a multimedia learning environment for eighth-grade math. Thus, considerations should be given to the characteristics of the learners themselves, the extent to which learners can choose to use scaffolds, and the inclusion of both domain-specific and domain-general scaffolds.

In sum, research generally shows positive results for applying instructional scaffolds to help students solve problems, but additional questions remain. As shown in Bulu and Pederson's (2010) study, fading scaffolds can be detrimental depending on the purpose of the supports. In order to show learners have internalized and transferred problem-solving processes the scaffolds must be removed, but the specific timing for removing scaffolds is unknown. Some CBLEs aim to develop real-time learning diagnoses and adaptive scaffolding, but this is quite complex and still in development (Azevedo et al. 2010). Greene and Land (2000) also found that over burdening learners with excessive prompts is detrimental to their learning and engagement. Finally, the type of question prompt (e.g., cognitive, metacognitive, content focused) results in different learning outcomes (Chen and Bradshaw 2007; Davis 2003; Ge and Land 2003; Ge, Chen, and Davis 2005), but the best mix of each type without overburdening the learner is yet to be determined.

Encouraging Problem-Solving Skill Transfer with CBLEs

Transfer refers to the application of previously learned material to new situations (Mayer 2013; Ritchhart and Perkins 2005). The transfer of problem-solving skills involves taking already acquired problem-solving skills or strategies and applying them in a new context. The process of transfer is not discrete but rather a matter of degree. In immediate transfer the problems solved are very similar to the training problems, therefore the skills easily transfer to the new problems (Fuchs et al. 2003). In near transfer the problems being solved are similar to the training problems, but may differ on a few superficial characteristics. Far transfer, however, requires the problem solver to apply skills to contexts that are quite different from the original training contexts, often in different domains (Ritchhart and Perkins 2005). Immediate, near, and far transfer represent three points on a continuum moving from

common (immediate) to rarely achieved (far). Influencing far transfer is quite difficult, yet remains a worthy and common goal in education.

While some studies have assumed that simply practicing problem-solving skills is sufficient for transfer, practice alone is not enough to ensure transfer (Phye 2011). The transfer of problem-solving skills relies on several factors including the problem solver's ability to recognize the problem's structure and relate it to previously solved problems. In order to identify analogous problems, individuals must first examine problem structures to create categories for future problems. Many problem-solving interventions provide specific instruction on identifying problem structures and categorizing problems based on previously solved problems (Cooper and Sweller 1987; Fuchs et al. 2003). Students' self-developed categories tend to be quite narrow (Fuchs et al.) and even limited by superficial quantity labels (Bassok 1990). Appropriate problem-solving instruction should assist students in broadening their categories in order to see past superficial problem details. Schwartz et al. (2011) found that transfer of problem-solving strategies improved when learners were given the opportunity to develop formulas on their own to solve problems rather than simply being given the formulas. These students spent more time analyzing the problem's structure and were able to identify similar structures in new problems which facilitated the transfer of skills.

Even instruction on problem identification and categorization is not enough to guarantee transfer of problem-solving skills. Fuchs et al. (2003) found that in addition to broadening third graders' math problem categories, they also needed to be explicitly taught to examine new problems' structures. Without prompting or cueing students to identify problem structures they are not likely to spontaneously transfer skills to novel problems (Bassok 1990; Cooper and Sweller 1987; Fuchs et al. 2003). Many studies have used question prompts to scaffold learners through problem solving, reminding them to examine problem structures and apply previously learned strategies where possible. These prompts form a general problem-solving procedure, similar to those suggested by Polya (1945) and Ge and Land (2004).

Research into the transfer of problem-solving skills is hindered by the importance of domain knowledge for problem solving. As Richhart and Perkins (2005) explain, the role of knowledge in problem solving and the limitations associated with situated cognition pose challenges for instilling transfer. Experts, for instance, are superior problem solvers in their domains due to the extensive domain knowledge and experience they possess (Chi and Glaser 1985; Novick and Bassok 2005; Ritchhart and Perkins 2005). In a comparison of experts and novices solving problems in the experts' domains, relevant domain knowledge was vital for analyzing problems and identifying the best solution path (Larkin 1980). In spite of experts' domain specific problem-solving expertise, these skills do not transfer to different contexts (Ritchhart and Perkins 2005). While domain knowledge is important in problem solving, it is possible that general problem-solving strategies can be transferred between domains.

What Features of Interventions Improve Transfer in Ill-Structured Problems?

Real world, ill-structured problems are diverse, non-routine problems, decreasing the likelihood of relying solely on expertise in solving these problems (Mayer 2013; Ritchhart

and Perkins 2005). The diversity in ill-structured problems and their solutions does not make them amenable to simple structure identification and formula application like well-structured problems. Instead, ill-structured problem solving benefits from a general pattern of processing that can be applied to all problems. Rather than providing instruction on problem structure and formulas for solution, ill-structured problem solving benefits from thinking procedures or guidelines that help the problem solver reach a solution.

While not many studies have examined the effectiveness of scaffolding prompts for transferring problem-solving skills between ill-structured problems, their success in helping students work through these processes is promising. Ge and Land (2004) classified question prompts into three categories: procedural prompts, elaboration prompts, and reflection prompts. Procedural prompts are aimed at students completing specific tasks, while elaboration prompts lead "learners to articulate thoughts and elicit explanations (Ge and Land 2004, 10)." Procedural prompts can help students learn cognitive strategies like problem solving, compared to elaboration prompts, which are geared towards knowledge construction. Reflection prompts, on the other hand, are metacognitive prompts that ask learners to plan monitor, and evaluate their progress and their processes.

A review of problem-solving research suggests that the transfer of cognitive skills is rarely attainable. However, studies examining transfer often expect participants to make large leaps between both content areas, learning activities, and even problem types without explicit instruction on how cognitive skills can be used in different ways (Richhart and Perkins 2005; Singley 1989). A more pedagogically sound approach to transfer research might be to first consider the difficulty of the transfer task and then customize supports for participants. Studies that carefully analyze transfer tasks to determine the necessary knowledge to transfer skills from one task to another and explicitly train participants with this knowledge will add significantly to the literature.

Some research also suggests that teaching for the transfer of cognitive skills will not be successful unless the individuals possess a disposition for transfer (Boscolo and Mason 2001). Bereiter (1995) argued that the transfer of cognitive skills is actually a disposition or behavioral tendency. The transfer of cognitive skills relies on additional training to improve the disposition towards thinking and application of thinking skills. Additional metacognitive instruction can improve the transfer of skills by helping students understand when and why these skills are used (Delclos and Harrington 1991). If students see the value and purpose of transferring skills, they may be more inclined to do so in new situations. While it may take a long time to develop behavioral tendencies, helping individuals see the value and purpose of transfer is an important first step.

Illustrating a CBLE Designed to Foster Metacognitive Problem-Solving Scaffolds

Solve It! is a computer-based problem-solving intervention that combines problem solving and metacognitive prompts to scaffold students solving ill-structured physics problems (Figure 1; DiFrancesca 2015).

Figure 1. Screen shot from Solve It! displaying the problem-solving scaffold and coinciding metacognitive scaffold.

Solve It! has two main goals, to improve conceptual physics knowledge and teach students general problem-solving strategies that can be applied to new problems in the future. Both of these goals are achieved through writing activities in the program that are designed to foster content learning and problem-solving skill acquisition.

Solve It! introduces students to real-world, ill-structured physics problems that are embedded in short stories. Once the problems are introduced, the story stops and students are asked to solve the problem and finish writing the story. The program scaffolds students through a five-step general problem-solving process using metacognitive problem-solving prompts to help students identify relevant physics knowledge and apply the knowledge to the

problem solution. Through repetitive use of the general problem-solving steps with metacognitive reflection, students internalize a model for approaching new problems. The addition of metacognitive prompts assists students in developing important conditional knowledge about the problem-solving steps and encourages them to monitor and evaluate the effectiveness of their problem-solving process.

Using *Solve It!*, DiFrancesca (2015) had seventh grade students (N = 117) to solve six real world, ill-structured physics problems to examine the impact of the intervention on science content knowledge and problem-solving skill development. Findings from this study indicate that students' students' content knowledge (F[1,103] = 26.84, p < .001 partial n^2 = .21) and problem-solving strategies (F[1,99] = 33.53, p < .001 partial n^2 = .25) did increase from pre to post assessment across conditions, as evidenced by the large effect sizes. Increases in content and problem-solving knowledge across conditions provide some evidence that complex problem-solving experiences can benefit students' learning. Increases in problem-solving strategies are seen as a positive outcome of the study given that this is a major component of the *Solve It!* program. While the pre/post problem-solving strategy assessment was meant to measure gains in problem-solving strategy knowledge, it also provided some evidence of strategy transfer. When describing how they would solve a problem outside of the intervention program, students independently applied strategies they learned during the intervention. The potential for *Solve It*! to assist students in learning and transferring problem-solving skills is exciting since this is a major goal in education. These findings provide support for the use of *Solve It!*, and similarly designed programs to increase students' problem-solving strategies and their ability to transfer these strategies outside of the CBLE.

SUGGESTIONS GOING FORWARD

The development of flexible problem-solving skills in K-12 students is a high-priority goal in education. CBLEs can assist educators in reaching this goal by teaching content and problem-solving skills simultaneously. As discussed, CBLEs can employ scaffolding and tailored support to learners, improving learning outcomes through individualization. The addition of metacognitive scaffolding prompts students to build important metacognitive knowledge related to problem-solving strategies, expanding learning beyond domain-specific content. There are three important considerations that need to be made as future programs are developed for these purposes.

While many CBLEs provide some sort of scaffolding to assist learners in solving problems, the addition of metacognitive scaffolding improves learning outcomes and skill acquisition. Metacognitive prompts promote planning, monitoring, and evaluation, all of which assist learners in building metacognitive knowledge for future problem-solving experiences. Metacognitive scaffolds can be domain-specific, facilitating the development of metacognitive knowledge for the current problem-solving scenario, or domain-general, promoting cognitive flexibility for future problems. Effective CBLEs will include both domain-specific and domain-general scaffolds to support learners' skill development and transfer of problem-solving skills.

In addition to developing metacognitive knowledge to encourage the transfer of these skills outside of the program, additional tools and activities should be included in the program to encourage learners to think about using these skills in the future. Learners struggle to spontaneously transfer skills and knowledge in unfamiliar contexts, but making this process clear to them ahead of time can be beneficial to their learning. CBLEs can provide direct instruction on transfer of problem-solving skills and content knowledge as well as activities that assist learners in this process.

A final consideration for the development of new CBLEs is their integration with regular classroom instruction. Intervention programs are often too short and distinct from the regular classroom instruction to lead to large or sustained learning in children. Well-integrated programs are supported with classroom lessons linking to the content and skills being taught. Stand-alone CBLEs are often not able to impact long-term learning, but programs whose content is reinforced through classroom activities and lessons may be able to have a greater impact on students' learning. Further, interventions that are too short cannot alter learners' long-term approaches to learning. CBLEs will be most effective when used repeatedly over an extended time frame. These considerations will allow learners to internalize the strategies being taught and provide opportunities to apply these strategies outside of the computer environment.

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THE CONTEXT DOES MATTER: TAKING INTO ACCOUNT THE INFLUENCE OF CONTEXTUAL VARIABLES IN LEARNING

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Chapter 6

PARENTAL SUPPORT IN EARLY CHILDHOOD AND ITS IMPORTANCE FOR THE BRAIN

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ABSTRACT

Early experiences affect neurodevelopment. Parenting differences, mostly in early childhood, leads to different development outcomes. Some kind of parenting are better for the development than others, neglect parenting (sadly a very common kind) leads to functional and structural (mainly hippocampal and cortical) changes. These changes affect negatively to behavior, emotion and cognition of the children. In some cases, these alterations last until the adulthood. Altered neurodevelopment due to neglect parenting is one of the possible explanations about academic failure.

Keywords: development, early stress, child maltreatment, neglect, maternal separation

INTRODUCTION

Early experiences shape an individual's physical and mental health throughout life. There are many examples of classic studies of neuroscience that help us to understand the role of experience in the induction of plastic brain changes, most of them, including the earliest ones, focused on the stimulation of sensory systems, like vision and hearing. However, there are more recent lines of work that have demonstrated the powerful effect of maternal contact and the brain changes occurring if it has been absent.

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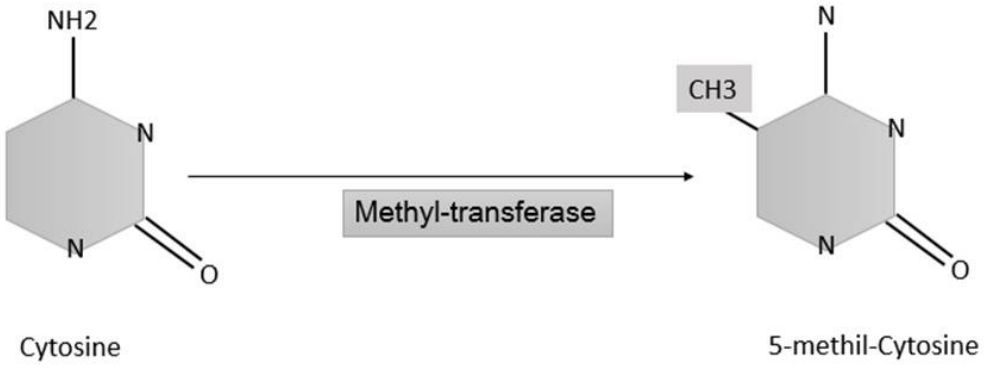

Figure 1. Addition of a methyl group on a cytosine. Methylation is catalyzed by enzyme methyl-transferase.

Experimentally, the group of Michael Meany performed three experiments that seem to confirm the mechanism that allows brain modification after maternal contact and the long-term effect of maternal care on the offspring. For this purpose, they focused on the impact of the variations that occur naturally in the behavior of female rats, observing, on the one hand, good mothers that raise their offspring with great care and attention, and careless mothers that neglect their offspring.The team examined the hippocampus, an essential brain region for the regulation of the stress response. They observed that genes that regulate the production of the glucocorticoid receptors and the sensitivity to stress hormones were highly methylated in the offspring of the negligent mothers. These changes did not occur in the offspring of the attentive mothers, the genes that regulate the production of the glucocorticoid receptors and therefore, the sensitivity to stress hormones, was highly methylated, and this did not occur in the offspring of the attentive mothers. Methylation is harmful because it affects the transcription of the affected genes and, in this case, methylation prevented the transcription of the normal number of glucocorticoid receptors needed by the offspring's brains. Thus, due to the lack of sufficient glucocorticoid receptors, the rats grew up exhibiting very anxious behaviors. Thus, variations in the parenting style alter the function of the hypothalamic-pituitary-adrenal axis, causing different levels of stress and producing different effects in the brain of the offspring.

To demonstrate that the effects were purely due to maternal behavior and not to the genes, the group performed a second experiment. They exchanged the litters of rats: now, the offspring of the negligent mothers were raised by the more attentive mothers and vice versa. They observed that the rats born of attentive mothers but raised by a negligent mother developed inadequate levels of glucocorticoid receptors in the hippocampus and behaved anxiously. Likewise, the rats born of the negligent mothers, but cared for by attentive mothers, developed calm behaviors and had high levels of glucocorticoid receptors and non-methylated genes.

In addition, these researchers performed a third crucial experiment because it could be argued that the changes were due to emotional effects and were not related to epigenetic change (Caldji et al. 1998; Dong Liu et al. 1997). Therefore, using another litter of rats bred by bad mothers, they injected trichostatin A into their brains, which is a drug that can eliminate methyl groups and therefore, gene methylation. These animals showed none of the behavioral deficits normally observed in such offspring, and their brains showed no

epigenetic changes. Thus, by studying the hippocampal glucocorticoid receptor gene, they found that maternity care regulates its expression through two processes: through acetylation of the H3-K9 histone in the RGR gene and by increasing the NGF1-A transcription factor, inducing hippomethylation of the dinucleotides (Weaver, Meaney and Szyf 2006).

In the human being, it is still unclear whether variations in parental care within normal limits are relevant for neurological development. Studies with rodents suggest that this is so, but the human brain development is produced within a more complex environmental context and for a longer period of time. Parenting experience in humans has some unique features compared to other mammals, which leads to greater cortical complexity and more emotional and behavioral control.

However, there is now strong evidence that we share many subcortical neural and neurochemical mechanisms with other mammals and that, like them, we need parental care and support to develop lower vulnerability to mental disease and learning disorders.

In this sense, experiments with preschool children were conducted to investigate the relation between emotional support during development, which represents one of the most relevant aspects of childcare, and the severity of depression in preschool children. In general, preschool depression is comparable to the same disorder in adults. Depressed children express sadness and anhedonia (they do not enjoy playing), although there are some interesting differences, as children who suffer depression may also be irritable and angry. It has also been observed that, when there is a predominance of emotional support in the parents' child-raising style, the severity of school depression is lower and, in contrast, when the parents are not emotionally available, depressive symptoms are more intense (Belden and Luby 2006).

Luby's group very recently conducted a prospective, longitudinal study that examined the association between paternal support at preschool age and the volume of the hippocampus, by means of magnetic resonance at three temporal points throughout school age and early adolescence. Caregiver support was classified as low, medium, or high by means of observation of parents' behavior in a task of interaction between father and the child. The volume of the hippocampus was observed to increase faster in children with higher levels of parental support. The children with parental support of one standard deviation above the average had twice the hippocampal volume in all three scans throughout school age and adolescence than the children with one standard deviation below the average. This longitudinal approach reveals a convincing association between parental support and the trajectories of hippocampal growth. The hippocampus is an important structure for learning, memory, and stress response, and may be the key to socio-emotional behavior problems and learning problems (Luby et al. 2016).

Regarding hippocampal development, it has been observed that infants who are born with low birth weight develop alterations in their stress axis, but there is much variability in the severity and type of changes that occur in these children. To clarify the influence of other factors in the brain development of these children, an investigation was carried out in which other possible mediator variables were explored. The authors discovered that birth weight could predict hippocampal volume, but only if it was combined with low maternal care. That is, for low birth weight to influence neurodevelopment negatively, it must be linked to slightly poor maternal care, or looking at the positive side, the deleterious effects of low birth weight on brain development can be minimized with optimal maternal care (Buss et al. 2007).

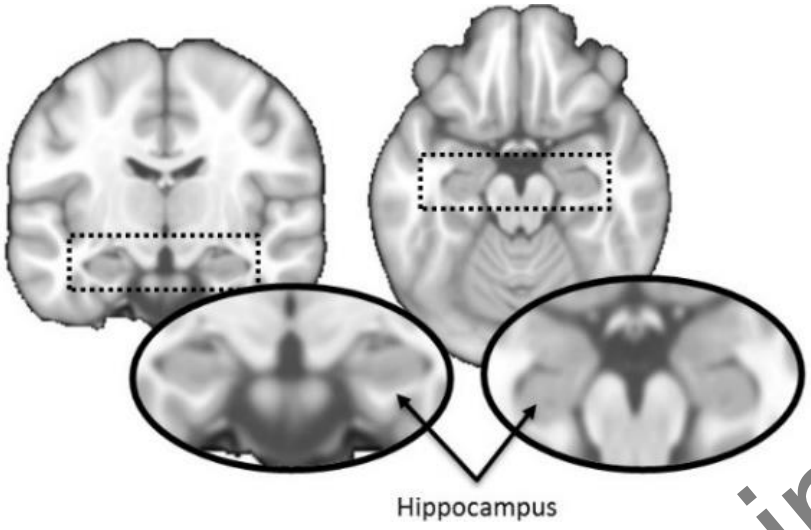

Figure 2. Magnetic Resonance Image of hippocampus. Left: Coronal plane, Right: horizontal plane. Image conceded by Juan Francisco Navas Pérez MSc from faculty of Psychology, University of Granada.

The neurodevelopmental programming produced by the type of early maternal care not only influences the size of brain structures but also affects neurotransmission. In the face of a stressful situation, either natural or created in the laboratory, dopamine is secreted in the ventral striatum, increasing levels of cortisol. The quantity of dopamine secreted correlates positively with the level of cortisol. It is interesting that adult subjects who received more parental care as children show a lower increase in their levels of dopamine and cortisol in a stressful situation, whereas those who received low maternal care show greater stress responses (Pruessner et al. 2004).

Neuroscience has helped clarify how, during early postnatal life, the brain shows high plasticity that allows environmental signals to alter the paths of the developing brain circuits. Recent studies have helped us to understand the epigenetic mechanisms through which life conditions during the first months are translated into long-lasting changes in the gene expression of regions that sustain brain functions that are important for learning. In addition, this early experience may act on key brain structures for the acquisition of learning and the regulation of emotional behavior.

TYPES OF CHILD ABUSE: NEGLECT, A FORM OF EARLY CHRONIC STRESS

Stress has been mentioned several times in this chapter, but what do we mean when we talk about stress? Stress refers to the challenges faced by an organism across its life span. Stressors, which can be internal or external, activate the stress response that mobilizes various systems in order to respond to the challenge. When the body faces a stressor, the sympathetic branch of the autonomous nervous system is activated to mobilize energy through the release of catecholamines such as noradrenaline and adrenaline. A second phase involves the so-called "stress axis", which consists of a hierarchical system composed of several regions. At

the top of the hierarchy is the first region, the hypothalamus, whose paraventricular nucleus neurons secrete the corticotropin-releasing factor to the porta-pituitary system, where the adenohypophysis — upon receiving this signal —segregates the adrenocorticotropin hormone into the circulatory system, which stimulates the adrenal glands, which finally secrete glucocorticoids. It should be noted that these glucocorticoids return to the brain through the circulatory system, where they perform a function of negative feedback on the hypothalamic neurons, ceasing their secretion. The steroid stress hormones or glucocorticoids exert an enormous amount of effects due to the fact that almost all the cells of the body express glucocorticoid receptors, so very few remain insensitive.

This stress response is adaptive, it helps the body to face challenges, either fighting or fleeing. However, sometimes, stress becomes chronic. The effects produced by stress hormones are beneficial at the short term (optimal levels of arousal and stress are necessary for learning) but harmful when they are prolonged over time. These effects are negative during the entire life span, but there are certain ontogenetic periods in which they are even more harmful, and one of these sensitive periods includes the individual's first years of life.

However, two circumstances may occur: the negative effects of early stress may be entirely maladaptive or they may reflect a more complex balance of costs and benefits. It could be that stress changes the direction of development towards strategies that are biologically adaptive if the organism's environment is unpredictable or unreliable (Del Giudice 2014). Children who suffer punctual maltreatment do not develop the negative effects caused by early stress, which indicates that maltreatment must be chronic to produce deleterious consequences (Cowell et al. 2015).

Early chronic stress is defined as a period of severe and chronic trauma as well as environmental and/or social deprivation, which can either be combined or not with negligent pre- and/or post-natal care (Hedges and Woon 2011). Unfortunately, this type of stress is suffered by a large number of children worldwide. Although the effects caused by early stress are adaptive for an unpredictable environment, the problems arise later on because when the child maltreatment ceases, the organism continues to respond as if the environment was hostile. Apparently, when an emotional stressor reappears (in the subject's adulthood), the response of the body's stress axis increases, that is, children who suffered early stress exhibit a sensitization response (De Bellis and Zisk 2014).

But what challenges can the organism face in childhood? The abuses that children may suffer can vary in duration and type. There is physical, sexual, and psychological abuse, as well as negligence. In addition, these types of abuse may be combined (Trickett and McBride-Chang 1995), in fact, more than one half of maltreated children have suffered multiple abuse (Cowell et al. 2015).

Emotional maltreatment consists both of committed (verbal abuse) and omitted acts (negligence) (Van Harmelen et al. 2010). Among all the types of abuse, neglect is the most prevalent form of child maltreatment (De Bellis, Woolley and Hooper 2013). Physical neglect involves abandonment or failure to provide for children's needs of nutrition, hygiene, clothing, and security. Emotional neglect implies not performing or delaying the provision of psychological care (affection, attention, non-exposure to violence…). There are also concrete negligent behaviors such as medical negligence, which refers to not providing the children with adequate medical care, or academic negligence, which is related to non-schooling (De Bellis 2005; De Bellis, Woolley and Hooper 2013).

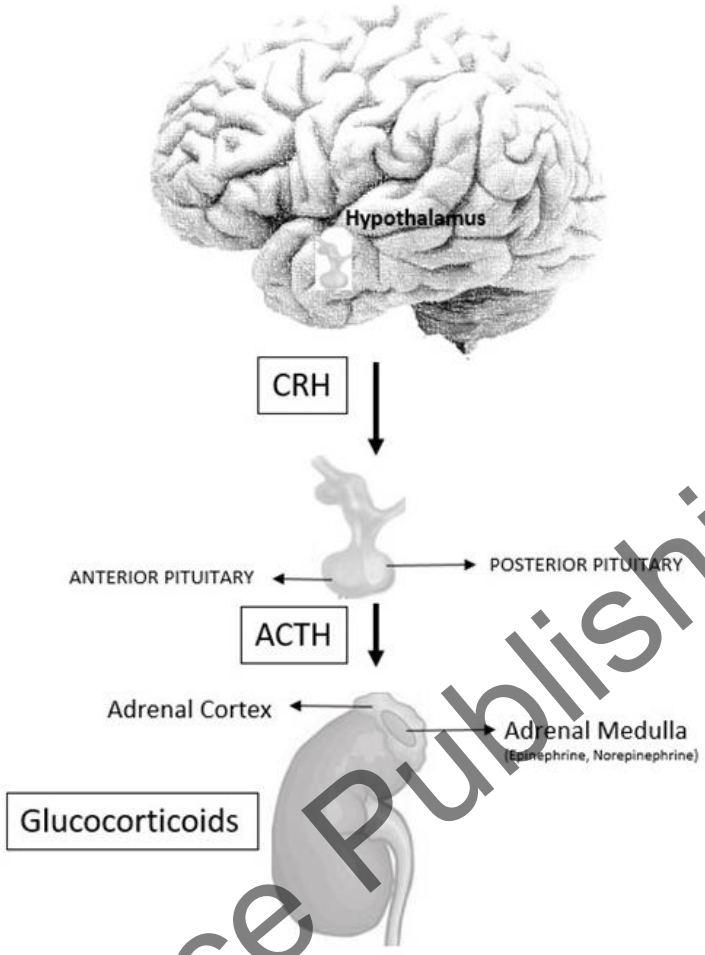

Figure 3. Hypothalamic-pituitary-adrenal axis. Hypothalamus release corticotropin-releasing hormone (CRF). When CRF binds to CRF receptors on the anterior pituitary gland, adrenocorticotropic hormone (ACTH) is released. ACTH binds to receptors on the adrenal cortex and stimulates adrenal release of glucocorticoids.

In short, negligence occurs when a caregiver fails to provide the child with the minimum care, including emotional neglect, when the caregiver does not take care of the child's minimal emotional needs (Cowell et al. 2015). According to the Diagnostic and Statistical Manual of Mental Disorders-V (DSM-V), childhood trauma is the "exposure to actual or threatened death, as well as to physical injury or to sexual violence". In various senses, childhood trauma can be considered as a complex developmental disorder, although it is environmentally induced. The fact that childhood trauma, or the exposure to early chronic stress, is presented in the diagnostic manual DSM-V gives us an idea of the relevance and consistency of the disorder.

Certainly, the problem of neglect is cross-cultural and highly relevant because it represents 78% of all the cases of maltreatment, 86% if we count combined abuse. More than 50% of all the children in the world are exposed to stress (Fenoglio, Brunson, and Baram 2006). Each year, 1 out of 10 children born in the West experiences emotional maltreatment (Van Harmelen et al. 2010). More than half of the abused children in the United States have

suffered neglect (Mills et al. 2011). The rate of occurrence of child abuse varies depending on the country, but it ranges between 3 and 32% of the total population (Van Harmelen et al. 2010). According to the World Health Organization in its fact sheet number 150 posted in 2014, 25% of all adults report having suffered abuse as children, that is, one out of every four people.

CHARACTERISTICS OF THE STRESSED BRAIN

As we have just seen, the prevalence of child maltreatment is very high, but why is it so alarming? Because when subjects have suffered early stress, they display a series of functional and structural changes. Almost all the domains are affected to a greater or lesser extent. Firstly, there are emotional or affective alterations such as anxiety disorders, depression, and posttraumatic stress disorder (Coplan et al. 1996; Fishbein et al. 2009; Koizumi and Takagishi 2014; Van Harmelen et al. 2010). Abused children show an elevation of the corticotropin-releasing factor (the hormone secreted by the hypothalamus, on the peak of the stress axis), which is maintained until adulthood. One of the receptors of the corticotropin-releasing factor, receptor type 1, which is located in practically all the areas of the brain, produces symptoms of anxiety and depression when activated (Bellis and Zisk 2014).

These changes occur because the subjects' nervous system did not develop optimally; the sustained stress response during early childhood influenced the organization of the different systems (nervous, immune, and endocrine systems) so that their adult functioning is different from that of subjects whose childhood was not stressful. In summary, the development of the central nervous system occurs as follows: firstly, an overproduction of neurons occurs when the subject is still in the uterus. During childhood, the number of synapses increases—that is, the connections among neurons—, and some excess neurons, normally the neurons that failed to join a network, are eliminated by apoptosis. Then, the axons are surrounded by a white, fatty, isolating matter called myelin, in a process called myelinization, which increases the speed of communication of some connections (De Bellis and Zisk 2014). Of course, this does not occur homogeneously; instead, each area of the brain shows a differential pattern of development. This means that while some areas are completely mature, others are still developing. This is why different functional results can be found depending on when the stress occurs.

One of the more commonly found alterations is that of the connectivity, that is, a decline in the white matter tracts, the sets of myelinated axons that allow the different brain areas to communicate. The integrity of the white matter tracts can be measured by means of the diffusion tensor imaging (DTI) technique, which consists of measuring how well water diffuses in a tissue. When the images are not well defined (when water diffuses well), the tracts are less intact, whereas when the definition a good (when water diffuses badly), the tracts have greater integrity. The integrity of the tracts is compromised in children who suffered early stress; in fact, this decline in connectivity is virtually identical to that found in older patients with mild cognitive impairment (Sheridan et al. 2011).

Prolonged exposure to glucocorticoids produces neurotoxic effects: some of the areas where these effects are observable are the hippocampus and the prefrontal lobe. The damage

caused by the glucocorticoids in these regions is particularly concerning, as they are responsible for modulating the stress axis downwards, that is, in normal conditions, they inhibit it (Pruessner et al. 2010). In addition, early stress increases the density of glucocorticoid receptors in the central nervous system, which affects its maturation, for example, preventing the formation of synapses that occur during infancy in the hippocampus and prefrontal cortex, thus compromising the functions that depend on these brain areas (Cowell et al. 2015).

The additive effect of the two previous facts is clear: on the one hand, the receptors increase after the experience of early stress, which causes glucocorticoids to have more binding sites, increasing their effect and neurotoxicity, which is multiplied by the increase in receptors. The glucocorticoids decrease the hippocampal volume and the birth of new neurons, or neurogenesis, in this area. These facts have been proven in humans as well as in animals like apes and rodents, which also need adequate maternal care during their development (Lupien et al. 2007).

Another of the factors that influences hippocampal volume is the loss of neurons and dendritic atrophy, both of which contribute to its decreased volume in subjects who suffered childhood neglect (Marin et al. 2011; Pruessner et al. 2010). Early chronic stress affects the hippocampus because it is one of the areas that continues to develop in postnatal stages; in fact, the establishment of synapses in this structure continues for years in humans and, therefore, chronic stress in this period interrupts and/or alters its normal development. One of the key aspects of the brain to understand how early stress affects the hippocampus and therefore the functions in which it participates, such as learning and memory, are the interneurons that express receptors for the corticotropin-releasing factor. These interneurons innervate the hippocampal pyramidal cells: the number and activity of these cells is regulated by the quantity of the corticotropin-releasing factor and, therefore, high levels of continued stress are harmful (Brunson and Avishai-Eliner 2001; Fenoglio, Brunson and Baram 2006).

Why are the negative effects of stress on the hippocampus so relevant? Because there is a relation between the volume of the hippocampus, cognitive performance, and the function of the stress axis (Marin et al. 2011; Pruessner et al. 2010). If the stress axis is chronically activated, it will release glucocorticoids that will produce alterations in the hippocampus, and if the hippocampal structure is not in perfect condition, it will not be able to support its functions. The hippocampal formation is needed for spatial navigation, for example, to know how to go home. Thanks to the hippocampus and a series of special cells it contains, we are capable of generating spatial maps (of our home, a city, or our workplace). These special cells are neurons that respond differentially to different places, which is why they are called "place cells". They allow us to learn new locations and the spatial relations among them.

The hippocampal formation is also essential to learn new contents. These contents can be biographical, such as being able to remember daily activities (I ate rice today) or they can also be related to events (last month, there was a fire). The hippocampus also is in charge of helping us remember new data such as the capitals of cities or the names of presidents. This structure supports these relevant functions, as it is responsible for consolidating memory; that is, it turns the short-term memory—what we remember for a short period of time—into the long-term memory, that is, the memories that we store in the diverse cerebral cortices for years or even for our entire lifetime.

With regard to another of the regions affected by early chronic stress, the prefrontal cortex, some neuroimaging studies indicate that its volume is lower in children who suffered

abuse at early ages (Spann, Mayes and Kalmar 2012) and it also shows less activity (Sheridan et al. 2011). That is, early stress can cause the prefrontal cortex of stressed people to have a lower number of cells or a lower number of connections. Early stress therefore structurally influences the development of this brain area. It was also found that its electrophysiological activity is lower than that of the controls, which indicates that the resulting functioning of this altered structure was not optimal.

The prefrontal cortex performs very extensive functions: among the best known are its participation in social behavior, behavioral inhibition (for example, not eating the dessert of someone who is seated at our table), emotional control (knowing how to manage anger and not act violently towards other people), goal-directed behavior (such as studying to pass an exam), sensitivity to consequences (learning from our mistakes as well as from our successes), attention, and cognitive flexibility, that is, changing a strategy when the one used previously is not working (Fishbein et al. 2009). Therefore a loss of neurons in this area or its abnormal development, such as poor pruning (remember that pruning of connections among neurons is required for proper development of the central nervous system), produces observable effects in many domains.

The prefrontal cortex has extensive connections with many parts of the brain such as the cerebellum or the thalamus. It is attached to the limbic system by means of the uncinate fasciculus. The name limbic system derives from limbic lobe, a term introduced by Paul Broca, in reference to the series of structures under the neocortex, among other areas. It contains the amygdaline and hippocampal formations, as well as the cortices surrounding the hippocampus and the cingulate cortex, and the hypothalamus or the ventral tegmental area. The limbic system is in charge of physiological responses to emotional stimuli. The areas that form the limbic system orchestrate motivated behavior, that is, behaviors related to feeding, hydration, or reproduction, and it supports the necessary memories to access these reinforcers.

The limbic system has therefore been linked to the emotional brain and, consequently, in order to manage emotions and control behavior, we need other structures that interact with the limbic system and control its activity. Through this tract, the uncinate fasciculus, the prefrontal cortex exerts inhibitory control over the limbic system; this frontal-limbic network permits emotional control, in other words, it allows socially adapted behavior (Sheridan et al. 2011). If the development of the prefrontal cortex is compromised, the subject's social cognition will also be affected (Koizumi and Takagishi 2014). Early chronic stress disables the inhibition of the amygdala (one of the key areas of the limbic system, which is responsible for fear-related memories, among other functions) by the prefrontal cortex. This deactivation is observed in adults who were abused in early childhood (De Bellis, Woolley and Hooper 2013).

As a conclusion, we could state that early stress has deleterious effects on diverse brain areas such as those belonging to the frontal-limbic network. However, it should be noted that we find traces of early chronic stress in absolutely all the organism's cells. This conclusion is a result of studies that explore the genetic material found in the nuclei of the cells. The telomeres, which are a sequence of repetitive bases at the end of the chromosomes, become shorter with each cell division, and, therefore, they are considered to be a clock of cell ageing. In a study with abused children, it was discovered that, compared with same-age children, these abused children had shorter telomeres, which means that they suffered from premature ageing (De Bellis and Zisk 2014).

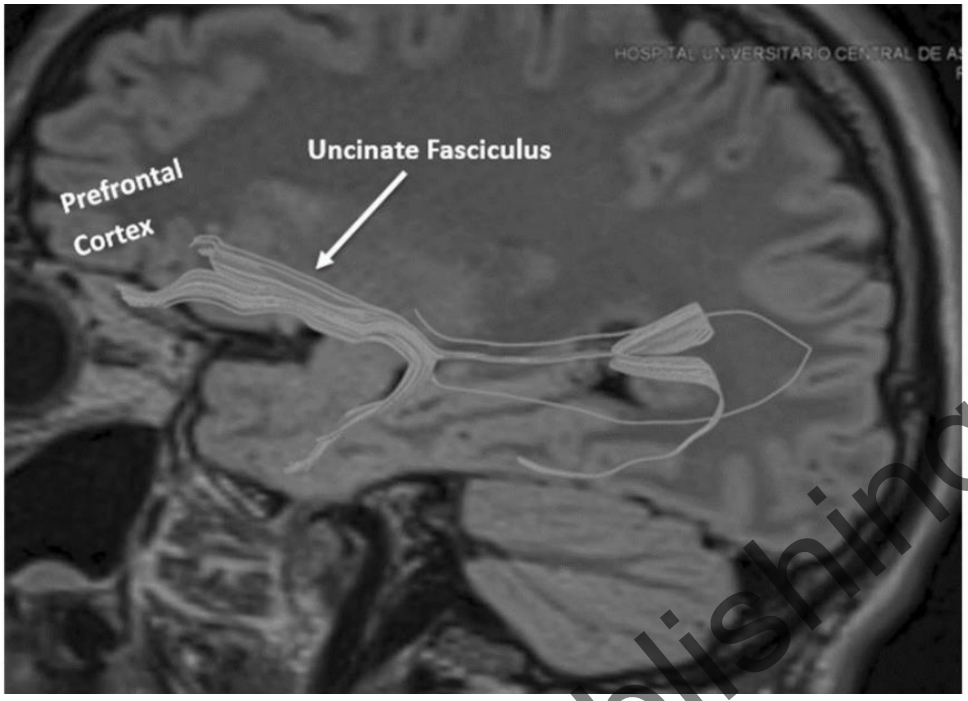

Figure 4. Diffusion Tensor Imaging (DTI) of uncinate fasciculus. Image conceded by Antonio Saiz Ayala MD PhD from central university hospital of Asturias (HUCA).

LEARNING AND ACADEMIC FAILURE: CONSEQUENCES OF EARLY STRESS

As we have just seen, early chronic stress leads to alterations in the normal development of the nervous system. Specifically, it affects areas that are essential for learning, and therefore, for success in the academic setting. Therefore, the effects on cognition resulting from early stress have been studied in depth. In addition, the relation between childhood abuse and cognitive functions is clear because alterations in the scores of different cognitive domains found in children who suffered early chronic stress are maintained even after eliminating sociodemographic factors that could explain academic failure, such as the mother's IQ, childbirth complications, gender, ethnicity and birth weight (Bosquet et al. 2013).

Various domains such as language, memory, attention (indispensable for academic success), and the executive functions are altered. Abused children show poorer memory and worse response inhibition (Hedges and Woon 2011; Marin et al. 2011) as well as slower processing speed and decreased working memory (Loughan and Perna 2014).

In addition, children who have suffered early stress tend to have greater cognitive bias than controls. For example, they tend to interpret social cues as more hostile than do non-abused children (Trickett and McBride-Chang 1995) and, in general, their recognition of positive expressions is worse (Fishbein et al. 2009; Koizumi and Takagishi 2014).

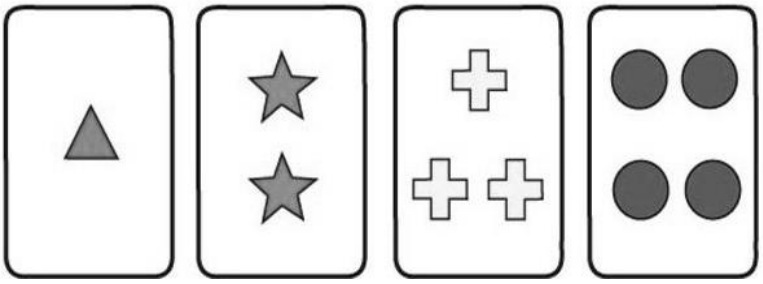

Figure 5. Card examples from Wisconsin Card Test.

The Ekman Facial Recognition Test is used to detect how a person recognizes emotions in others. This test measures a person's capacity to identify emotional expressions in the face. The participants should recognize different emotions (happiness, anger, disgust, surprise, sadness, and fear). In a typical assessment process, 60 different faces are presented, and the number of correct responses is measured. Abused children fail more frequently when positive emotions such as happiness or surprise are presented (Fishbein et al. 2009).

In addition, there are other tests to assess the capacity of emotion recognition such as the Reading the Mind in the Eyes Test. This test consists of 28 photographs of human faces reduced to the part of the eyes and eyebrows and that express diverse emotions. These emotions are somewhat more complex than those of the Ekman Facial Recognition Test. The emotions are divided into positive (sympathy, friendship, interest, hope, happiness), negative (sadness, anger, worry, displeasure), and neutral (recall, seriousness, nervousness, thoughtful). The image of the eye area of the face is shown to the participant who is undergoing assessment of emotion recognition, and four possible response options are offered. As in the previous test, in this case, abused subjects fail more frequently in emotion recognition when the eyes indicate positive emotions, that is, they recognize the positive emotions worse than do the controls (Koizumi and Takagishi 2014). The brain areas involved in emotion recognition or social cognition, like the superior temporal gyrus and the orbitofrontal cortex, do not achieve an optimal development in abused children, which explains the results obtained in the test (De Bellis and Zisk 2014).

Cognitive flexibility is also handicapped: children who were abused are less flexible than those who had a stress-free childhood and, surprisingly, they are also less flexible than children who suffered a short hypoxic period.

To explore flexibility, one of the tasks usually performed is the Wisconsin Card Sorting Test. This test consists of a deck of cards which has three attributes. The first attribute is the shape (triangle, star, cross, and circle), the second is the color (red, blue, green, and yellow), and the third is the number of elements (from one to four). The investigator asks the subjects to order these cards according to a certain criterion, and if the subject chooses the wrong criterion, the experimenter tells them. Flexible subjects will change the criterion whenever they become aware of their mistake. Once the participant performs ten correct consecutive responses, the experimenter changes the criterion without prior notice. Flexible subjects will try other arrangements until they find the new criterion, whereas an inflexible participant will tend to perform the task with the previous criterion, which is no longer correct. This is what happens to children who were abused; they show greater inflexibility, in other words, a lower tendency to change the criterion compared to the controls (Loughan and Perna 2014).

All of these abilities (social cognition, cognitive flexibility, emotion recognition) are dependent on the optimal functioning of the prefrontal lobe, and are essential for development in the academic setting, as they should be pre-existing skills.

As mentioned, abused children have less inhibitory control and a poorer working memory. This is because the frontolimbic networks are some of the brain pathways that are most affected in abused children. That is, there is a structural deficit in the connections between the frontal cortex and the limbic system.

Low self-control, which is derived from low inhibitory control, correlates with more health problems, a greater tendency towards drug dependence, and more economic problems in the social setting. The areas of interest for self-control, that is, those that support this function, are the inferior frontal cortex, the superior frontal gyrus, the anterior cingulate cortex, the caudate, and the ventral striatum. All of them show differences in activity based on the execution of self-control. It has been shown that abused children have less electric activity and a lower metabolism in the prefrontal cortex than the controls. Self-control is a very relevant capacity because it is related to all the goal-directed processes, from studying for an exam to saving for the future (Cowell et al. 2015).

To reach these conclusions, a study with abused and non-abused children aged 3 to 9 years was conducted, measuring inhibitory control and working memory with the day-night Stroop task. In this task, the children were required to keep two rules in mind, on the one hand, to inhibit the presented stimulus and, on the other, to name the opposite stimulus. Cards with drawings that represent daytime are presented and the children must say night, and vice versa. The scores are obtained by counting the number of correct responses and the response latency. Besides inhibitory control and working memory, memory and recognition are also measured with the Corsi-Milner Test. In this test, children are shown a series of photos on cards. In one condition, they should remember the temporal order in which the cards were presented, and in the recognition condition, they should say whether or not the test card was presented. If they recognize the card correctly in the recognition condition or they remember the correct order in the temporal memory condition, they obtain higher scores. As control task, the researchers used a motor task. This task involves the bisection of lines and it measures spatial perception. Twelve sheets of paper with straight lines are presented to the subject who is asked to mark the halfway point. The scores in the test are obtained by measuring the quantity of total deviation from the center. In this task, abused children's performance is no different from those who did not suffer from early chronic stress.

In the tasks that measure memory (memory, recognition, and working memory) as well as inhibitory control, the abused subjects obtained worse scores. This indicates that the essential skills for self-control are lower in abused children. In addition, these tasks showed that, if the abuse takes place earlier, the results are worse, indicating that the time of the development in which the maltreatment occurs is highly relevant (Cowell et al. 2015).

Neglect suffered in childhood also affects the linguistic capacity. In fact, early stress is associated with language delay, both in reception and expression (Spratt et al. 2012). One of the linguistic tests that has been used to determine abused children's capacity is the Test of Early Language Development (TELD), which was created to be used with children aged from 2 to 6 years. If the children to be studied are aged between 7 and 9 years, the Test of Language Development (TOLD) can be used, whereas if the target sample is made up of adolescents, that is, participants between 8 and 18 years, the alternative is to use the TOLD-Intermediate. These three tests measure linguistic capacity, both expressive and receptive, by

means of various subtests: vocabulary with images, vocabulary to relate words, syntactic comprehension, analysis of words in phonemes, articulation, etc. In these measures of linguistic capacity, abused children obtain worse scores than the controls. Some authors indicate that the linguistic problem found in these children is a consequence of a prior deficit in working memory, which influences comprehension skill, especially in more difficult texts.

Obviously, the capacity of comprehension is required for a good academic performance. In order to assess comprehension of more complex language, the test of assessment of the Capacity of Spoken Language Comprehension (CASL) is usually used. It contains a subtest of paragraph comprehension that measures auditive syntax comprehension in spoken utterances. In this task, the children listen to a story and then answer some questions by choosing one of four options described in drawings. The questions usually refer to relationships in the text or contexts, not to the recall of specific words. Abused children obtain worse scores in the CASL, which is not surprising because, as mentioned, they also score lower in the TOLD or the TELD.

The interesting aspect is that there is a correlation between the CASL scores and the score in working memory tasks such as the working memory subtest of the Cambridge Neuropsychological Test Battery (CANTAB). In this task, the subject must retain spatial information and manipulate it in order to answer correctly. The task is performed on a screen that shows some boxes in which there are some tokens of various colors that are shown to the subject, who must then remember in which boxes were the tokens of a particular color. One of the advantages of this test is that besides measuring errors, it can measure the strategy used by the subjects (for example, always starting with the same box is a more efficient strategy). Abused children obtain worse scores and use less efficient strategies in the spatial working memory task of the CANTAB. This deficit in this relevant cognitive skill could be underlying the difficulties to comprehend more complex texts (Desmarais et al. 2012), which would eventually lead to a poorer academic performance because understanding the instructions of an exercise or the explanation of a subject is indispensable for academic success.

Many authors have found that abused children show a worse academic performance and obtain poorer scores in intelligence tests, and their IQ is also lower; sometimes, one third lower than that of children who were not abused (Fox et al. 2011; Mills et al. 2011; Sheridan et al. 2011). In addition, stressed children attain fewer academic achievements (De Bellis, Woolley and Hooper 2013; Fishbein et al. 2009; Manly et al. 2013; Trickett and McBride-Chang 1995) and are twice as likely to repeat a year (Loughan and Perna 2014; Manly et al. 2013; Spratt et al. 2012). They also show poorer work habits and they have problems working independently.

To explore the work habits of these children, information can be obtained from the academic staff. In a study, the academic staff of abused children completed the Teacher-Child Rating Scale 2.1 to assess 32 elements that explore the social, behavioral, and academic competences of these children. The scale evaluates four positive elements and four negative ones, arranged in three scales, task-orientation, behavioral control and social skills with peers. Abused children were rated by their teachers as less task-oriented and with less behavioral control (De Bellis, Woolley and Hooper 2013; Manly et al. 2013). The academic failure of these children is not only related to their cognitive skills; neglected children are also observed to exhibit more behavioral problems (Fishbein et al. 2009; Spratt et al. 2012). These behavioral problems translate into less effective social interaction in childhood and a greater tendency towards delinquency in adolescence (Trickett and McBride-Chang 1995).

In short, the poor academic results of children who suffered early stress not only depends on their cognitive deficits but also, their adaptation to school involves non-academic competences such as managing their own behavior (Manly et al. 2013).

CONCLUSION

Chronic stress produces negative effects on the organism. Early chronic stress influences neurodevelopment, leading to structural and functional changes that can be observed throughout the life of the individual. Early stress and its derived problems are extremely relevant have extremely high social relevance because such stress is a source of human suffering that has cognitive, emotional, behavioral, and social consequences. Early chronic stress is a very important mediator in academic failure.

Some authors have proposed that early stress could lead to the development of improved coping skills but resilience is not a common effect after suffering from childhood trauma. In fact, women who grew up in poor environments but who were not abused show more resilience than those who were abused although they grew up in economically more favored environments (De Bellis and Zisk 2014).

There are many initiatives that are intended to minimize the problem of early stress. One of them is carried out by the World Health Organization in its section on Child Maltreatment, in which it is committed to multidisciplinary prevention: classes for parents to improve parenting styles, social workers to manage social support and more adequate resources, and health professionals to provide prevention and integral treatment of the physical and psychological health problems of children from early ages. Another way in which we could contribute to minimize or prevent the effects of early stress on children is to reveal, in their entirety, the cerebral bases of the harmful consequences produced by early stress. Knowing the functioning of a process can allow us to prevent its onset or even to reverse it.

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Chapter 7

REVIEW OF THE PARTNERSHIP BETWEEN SCHOOL AND FAMILY: A SHARED RESPONSIBILITY

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ABSTRACT

This chapter aims to provide a theoretical review of collaboration between schools and families. The importance of both educational contexts for the building of human and social capital, given its socialising function, has been pointed out. So, we emphasise the need to encourage education quality from both institutions as it affects the development of personal competences of children, adolescents and youths, which facilitate their social adjustment and prevent problems as absenteeism, dropout and academic failure. Therefore, there is an underlying need to support these education agents, and enhance a greater collaboration between them. In this regard, the word partnership is conceptualised as a recurrent term in the reviewed scientific literature, and the functions, expectations and mutual requirements perceived between families and schools. The Ecological Model of Human Development (Bronfenbrenner 1987), and the Model of Overlapping Spheres of Influence (Epstein 1990) are mentioned as theoretical basis of international reference within this field. Finally, this chapter concludes underlining the benefits resulting from such partnership, and suggesting some methodological and educational guidelines in order to enhance the relation between schools and families.

Keywords: partnership, family, school, quality, education, review

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INTRODUCTION. HUMAN AND SOCIAL CAPITAL: CONTRIBUTION OF FAMILIES AND SCHOOLS

The accumulated knowledge of a society is one of its main values, being able to state that "a society which does not invest in human capital is absolutely bound to fail, even in financial terms" (López, Utrilla and Valiño 2006, 16). Colom (2009) maintains that countries with better human resources, such as high levels of capacity and knowledge, have greater levels of wealth; the author recommends thus to the nations focused on increasing their human capital to promote and optimise the intellectual and academic development of their citizens. Meanwhile, Bernal (2005) claims that the investment in human capital contributes to improve, among others, the work quality and to create social capital; therefore, she suggests that nations have to face the challenge of providing their citizen with a quality education.

Intxausti (2010, 117) states that the term *social capital* mentions "the sum of current and potential resources related to the possession of long-lasting networks which allow more or less institutionalised knowledge and mutual recognition relations." This definition refers to the concept of *social networks*, conceived as intentional partnerships both formal and informal in which people acquire knowledge, values, habits and competences through means of socialising. However, for that to happen, Coleman (1988) points that there must be: 1) obligations and expectations; 2) information-flow capability of society, and 3) norms and sanctions. Taking these aspects into consideration, it seems clear that families and schools, through their socialisation process, contributes to create human and social capital, and to encourage development in their community (Bourdieu 1988; Bourdieu and Passeron 1977). Therefore, it should be advisable to support these education agents and the convenient cooperative partnership that may be established between them (Álvarez 2006; Mendel 2001; Torío, Hernández and Peña 2007; Symeou 2006).

The cooperation between schools and families constitutes a key strategy in order to encourage the positive development in kids and teenagers, and to prevent problems related to poor academic performance, absenteeism and dropout (Fletcher and Silberberg 2006; Martínez and Álvarez 2005; Martínez, Rodríguez and Gimeno 2010; Sreekanth 2010). So, it is considered as an indicator for education quality (Armengol 2001; Martínez, Rodríguez and Gimeno 2010; Montañés 2007; Musitu, Estévez and Jiménez 2010; Rosales 2007; Sarramona and Rodríguez 2010). Nevertheless, families present conditioning factors that may undermine the quality of their involvement in children's education.

SOCIAL FACTORS INFLUENCING PARENT INVOLVEMENT ON CHILDREN´S EDUCATION

The family generates human capital that contributes itself to generate social capital according to the nature and quality of their members' interactions: positive and assertive communication, strong emotional ties, etc. Surrounded by a society affected by several cultural, political, social and financial transformations (López 2008; Martínez-González et al. 2016), families are the reference point both for adults and children who made them up. Among these transformations stand out the new challenges arisen from the information and communication society (Castelli, Mendel and Ravn 2003), the immigration, the greater

training and certification requirements for entering the labour market (Martínez-González and Pérez 2006), the remarkably rates of unemployment and job insecurity (Santín 2005), and the continuous incorporation of women to the labour market (López, Utrilla and Valiño 2006; Navarro, Musitu and Herrero 2007). This latter aspect has progressively produced changes in the inner family dynamics and modified the demand of involvement of all members in order to enhance quality in the family life. However, it is not always possible to reach quality in family life when there is not time enough to interact with the couple and/or with their children (Martínez, Pérez and Álvarez 2007), or even when there is an only parental figure bearing the brunt of household chores, and education and child care tasks. These inner family living factors sometimes lead to the deconstruction of the couple relationship and the own family configuration, giving rise to transformations in the family composition and to a heterogeneous range of family forms. The difficulties to reconcile family, personal life and work in turn lead the parents to count on several aids and centres to take care of their children from very early ages. Moreover, from a socio-economic perspective, the decrease in employment opportunities and financial resources have increased the child poverty rates, both absolute and relative; the latter one with percentages between 6 and 17% at European levels (Huarcaya 2013). These problems that affects citizenship, families, youth and teenagers are associated with the risk of presenting further socioemotional, behavioural, health, cognitive, low academic performance (Symeou, Martínez and Álvarez 2012), and absenteeism problems (Seith and Isakson 2011).

The confluence of these latter and upcoming conditions makes the parents feel insecure about raising their children, showing in many cases doubts, confusion, and anxiety that hinder the proper performance of the role of parents (Martínez, Pérez and Álvarez 2007). Problems aforementioned such as the absenteeism, academic failure and dropout, and other problems such as risk of drugs use in adolescence, disruptive behaviour within schools and/or the family are often originated in low parenting skills families (Martínez et al. 2016). This does not facilitate an adequate development of the process of *primary socialisation* expected from the family institution (Álvarez 2006; Moreno 2002); it is not always easy for parents to adapt and organise their family structure, their daily life, their interaction, communication and relation patterns in order to give a quality educational answer while facing the new social challenges (Martínez, Rodríguez and Gimeno 2010).

It is noteworthy, with reference to the parent involvement in children and teenagers education, that according to previous researches (Sánchez et al. 2011) the level of academic progress of them will be related to aspects such as family typology, socioeconomic and cultural level of the parents, family interaction patterns, educational styles and practices, beliefs and convictions about education, etc. The family, as a natural context of socialisation, exerts the earliest and most permanent influence upon the human development (Álvarez 2006; Martínez and Álvarez 2005), the acquisition of values, beliefs, behavioural patterns, personality features, etc.; it might condition the way and level in which the children maintain autonomous relations within the school and society (Martínez, Pérez and Álvarez 2007; Robledo and García 2011).

Nevertheless, although the parents are the very first responsible for their children's education (Council of Europe 2006; Declaration on the Rights of the Child 1959; Universal Declaration of Human Rights 1948), their socialising function is complemented with the education system within the advanced societies. In this regard, schools act as agents of

secondary socialisation (Moreno 2002) providing learning environments and spaces that, if ideal conditions were met, strengthen and expand the personal development acquired by the children within the family (Tschorne, Villalta and Torrente 1992). As with the families, there is a need for schools to get adapted to new social demands and challenges facing processes of continuous transformation and updating; teachers must internalise a "*functional diversification*" by evolving from a role of knowledge transmission into a "*driver of learning, conflict manager, value trainer (...), socialising agent, group relations' catalyst (...)*" (García et al. 2010, 159).

Given the supplementary functions that families and schools assume within the process of socialisation and education of children and youth (Silva 2006), the following headings within this chapter are focused on analysing the partnership aimed to be established between them, in order to enhance a quality education that will allow to encourage educational success and prevent the academic failure and dropout (Álvarez 2006; García et al. 2010; Musitu, Estévez and Jiménez 2010; Symeou, Martínez and Álvarez 2012).

CONCEPTUAL APPROACH TO SCHOOLS AND FAMILIES PARTNERSHIP

The study of this topic is, internationally, widely supported by a vast number of authors and researchs (Braster 2001; Castelli, Mendel and Ravn 2003; Comellas 2006; Davies 2001; Davies et al. 2007; Deslandes 2001, 2006; Epstein 2011; Martínez, Pérez and Rodríguez 2005; Pepe and Addimando 2010; Phtiaka 1996; Rivas 2007; Silva 2006; Smit and Driessen 2009; Symeou 2005, 2006; Villas-Boas 2001; Webster-Stratton and Reid 2010).

The review of aforementioned studies set the main goal of schools and families partnership to encourage a greater education quality in order to enhance the personal and academic development of children, adolescents and youth (Garreta and Llevot 2007; Symeou, Martínez and Álvarez 2012; Villas-Boas 2003). When centres and families interact and work together properly in order to take joint decisions on the children and teenagers´ education, their relation is seen as a democratic expression and a guarantee of moving towards the achievement of education quality (Sarramona and Rodríguez 1999). Martínez and San Fabián (2002) underline the desirability of collaboration between the families and schools to become frequent and an adequate coordination of their educational functions to be established (Rivas 2007; Tschorne, Villalta and Torrente 1992). It make it easier to schools and teachers to better understand the social and family needs of the students, and better adapt to them the process of teaching-learning.

Since mid-1980s, scholars on this topic have been using the term *partnership* to refer in a holistic way to the institutional collaboration between schools, families and agents of the community environment in order to encourage the academic success and comprehensive development of students (Castelli, Mendel and Ravn 2003; Davies 1991; Davies et al. 2007; Epstein et al. 1997; Martínez, Pérez and Rodríguez 2005; Phtiaka and Symeonidou 2007). This expression includes processes related to *building relationships, linking to learning; addressing differences; supporting advocacy, and sharing power.* Azaola (2011), from the ecological systems perspective (Bronfenbrenner 1979), points to a three-fold dimension within the study of school-family-community partnership: 1) education policies

(macrosystem); 2) students and their families (family microsystem) and 3) schools and teachers (school microsystem). The school takes on a prominent role in this partnership, understanding that the institution is indeed in charge of enhance it by setting up processes and performances that may facilitate: 1) the communication between parents and teachers; 2) the participation of parents in the activities at the school; and 3) their involvement in education processes taking place in their homes (Fan and Chen 2001; Martínez-González et al. 2008). Symeou (2005) points out that both parents' involvement at home and in the life within the school are conditioned by teachers' actions to encourage parents to do so. Sreekanth (2010, 43) adds that when participation rates are high, "the environment at home and also the outlook of the children's education in school" benefits from it.

The expression *parent involvement* is commonly associated with the term *partnership*. Bakker and Denessen (2007), after a theoretical review and an empirical research about this concept with factor analysis, find in it three dimensions: *1) contact with the school; 2) learning at home; and 3) participation at school*. In terms of parents involvement in their children's education at home, Azaola (2011) comes to the conclusion, after a bibliographic review, that it is understood regarding two priority areas: 1) the importance that parents attach of teachers and schools as promoters of their involvement, regardless of their socioeconomic background; and 2) the relevance of the social class as a determining factor in participation at school. In the British context, the concept *parental/family involvement* is commonly used both in the research fields and in practice (Hoover-Dempsey et al. 2005, 106) to refer to "psychological processes and attributes that support student achievement." Meanwhile, in the USA Epstein (1995) suggests the expression *learning at home* to refer to the parent involvement in helping their children and/or adolescents with homework and learning. Xu and Filler (2008) add to this concept the idea of diversity; that is, parental involvement may vary according to the social and education context in which families, parents and students interact. To this must be added the parent's aspirations and expectations, as well as their attitude and beliefs about education. The following headings further develop these aspects.

FUNCTIONS, EXPECTATIONS AND MUTUAL DEMANDS BETWEEN SCHOOLS AND FAMILIES

The family, as a source of personal identity for their members (Altarejos, Rodríguez and Bernal 2005), performs the key social function of educating their children, together with the school. According to López, Ridao and Sánchez (2004), the education at home is characterised by a remarkably affective component of individual attachment and unconditional love for the children and the search of wellbeing. This is a substantial difference between the education in the family and that of the school. The process leading to achieve this family aim tend to generate, as well as satisfaction, times of frustration and disappointment in parents, since it is a complex task (Torío 2004) and many times they lack institutional and social support.

Meanwhile, within the school, teachers work in teams and have specific psycho-pedagogical training to develop their educational role. Nevertheless, their influence is much limited in time than that of the family —restricted to various school years and not along the life cycle—, and is exerted with a lower emotional bond (López, Ridao and Sánchez 2004).

Moreover, teachers tend to present a greater global attention to the students, aiming to the overall academic progress in class and a positive atmosphere in the centre. On the other hand, though both the family and academic contexts provide knowledges, the school do so based on a formal perspective, planned according to curricular and educative goals, and including evaluation processes to assess the level of learning competences' acquisition. López, Ridao and Sánchez (2004, 149), after a review of educational characteristics of the family and the school, points out that both agents "differ in types and ways of interaction, in teaching-learning strategies, in communication patterns, and in organization of partnerships." Notwithstanding, these authors suggest that such differences must not be considered as dissent, alienation, enmity or conflict, but as a source of opportunities which may lead to increase the potential of the acquired knowledge in each educational context. This can be achieved through the promotion of their partnership and collaboration for the benefit of the students, especially those who appear to have learning difficulties, academic failure or dropout risk. A regular and positive communication makes it possible to adjust the mutual expectations and to ensure coherence between their messages and acts, providing so prevention for students from learning difficulties or familiar, school or social adjustment (Comellas 2006). In this respect, Santín (2005, 107) indicates that each "*family unit must always bear in mind the vital importance in requiring more and better education for their children, as the school to be the key variable in order to achieve academic success at school.*" So, the adjustment of expectations that each education agent would do on the other will contribute to better enhance the development and wellbeing of students.

Families' Expectations about the School

Studies about families' expectations about the school points out that such expectations tend to be associated to the social status and the value placed on the education (Robledo and García 2011). However, there is a general trend of families expecting from teachers' educational guidelines on how to interact with their children in order to improve the latter personal and academic development (Martínez and Pérez 2006; Rabusicová 2005; Redding 2000). This expectation assumes greater importance when there is learning difficulties that anticipate academic failure or dropout (Robledo and García 2009). In such cases, the families usually feel confused and seek the teachers' support. In this respect, a research carried out by De la Guardia and Santana (2005) on the educational role of families and teachers shows that families assume that they do have a certain lack of educational experience, and a role of co-educator and clients within the educational system.

Table 1 contains families' expectations on the schools resulting from the analysis of literature review, and associated with the development of their children's competences (Martínez, Pérez and Álvarez 2007; Rivas and Ugarte 2014; Rivera and Milicic 2006; Sreekanth 2010):

Table 1. Families Expectations about the Schools Regarding their Children

❖ Acquire study and intellectual work skills and habits.
❖ Contribute to the comprehensive students' development and their proper social adjustment.
❖ Stimulate children's intellectual skills such as observation, comparison, categorization, experimentation, etc., that have an indirect impact in the team work and, so, achieve a proper school integration.
❖ Acquire democratic society's values: tolerance, inclusion, respect for rules of living together, acceptance of diversity, etc.
❖ Encourage a rational and critical use of ICT.
❖ Identify problems and learn how to solve them in a constructive manner.
❖ Promote the access of the students to the labour market through the acquisition of knowledge and personal (flexibility, responsibility...), social (positive attitude, motivation, assertiveness...), emotional (self-control, empathy...), and professional (related to one or various field of knowledge) specific skills.
❖ Foster a secure atmosphere within the schools in order to make the students feel protected against risk factors such as violent behaviours, drug use, absenteeism, etc.

Source: Own elaboration.

According to these expectations, parents look forward the schools to guarantee the best possible attention and education for their children and adolescents. For its part, schools also arouse expectations on the educational involvement of the families in order to provide an efficient education to the students.

School's Expectations about the Families

Some authors point out the existence of an ambivalent attitude of the teaching staff towards the involvement of the family, determining their expectations upon the parents (Álvarez and Martínez 2016; Macbeth 1989; Pepe and Addimando 2010). The teaching staff identifies a blend of the feel that families trespass their limits in their professional activities and the perception of the importance that parents get involved in the education of their children in order to achieve their academic goals and to make them able to adapt and apply the acquired knowledge in the centre to the specific needs of daily life (Webster-Stratton and Reid 2010).

Generally, the school expects families to collaborate in the educational tasks that they develop with their children, both participating at the centre and at home (Include-ed 2011). These expectations point towards two perceived categories of the parent role: administrative and educational (parenthood). According to the first one, parents are expected to participate in management and decision bodies of the centres, associations, voluntary activities, etc. Meanwhile, with regard to parenthood (López 2008; Xu and Filler 2008), it assumes the great relevance of the behaviour and attitude model of the parents due to the modelling and vicar learning that children experience through the observation and imitation of parent behaviours (Zelmanovich and Levinsky 2012). It must be noted as well the expectation that parents should provide their children opportunities to learn both at home and in the community. Table

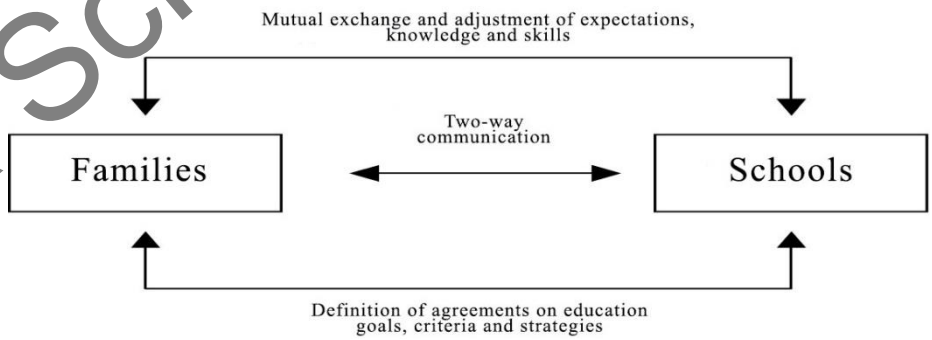
2 summarises frecuent schools' expectations upon families to complement and strengthen their teaching tasks (Ainscow et al. 2013; Torío, 2004):

Table 2. School Expectations about the Families

❖ Have a positive attitude towards education in general: motivate children to the study, support school activities, and ease the development of intellectual work habits
❖ Contact the teachers frequently.
❖ Strengthen the value of effort, empowerment and responsibility in the children, and the attitude of respect for authority and established rules at home and at the school.
❖ Take time to enjoy their families and children, especially bearing in mind dialogue and communication.
❖ Encourage healthy values and habits.
❖ Pay attention to the development of children personality (emotions, self-esteem, assertiveness, interests, sexuality, etc.). Be flexible, honest, close and affectionate.

Source: Own elaboration.

In this exchange of mutual expectations between families and schools, Rivera and Milicic (2006) warn that, generally, the school does not tend to take into consideration family diversity, which should condition parent involvement: members and typology, socio-cultural level, work and economic aspects, academic and personal expectations upon their children, etc. Notwithstanding, bearing in mind this diversity is crucial to adapt from the school the adequate measures to encourage family involvement and trust in teachers work; it also contributes to improve school and educational quality (Portillo-Torres 2015; Rodríguez, Martínez and Rodrigo 2016). Ultimately, what is important is that both agents reach a consensus on the education model for children and youth, and define from a democratic perspective the specific role that each agent is going to play within, leading so to the education quality (Bernal 2005; De la Guardia and Santana 2005; Sarramona and Roca 2007). A suggested model is included in the Figure 1, which summarises expectations and collaboration challenges within the schools and the families:



Source: Own elaboration.

Figure 1. Shared Responsibilities between Schools and Families.

The model suggests that there must be, at least, the concurrence of three aspects in order to ensure an ideal family collaboration: 1) exchange of knowledge and skills, and mutual adjustment of expectations; 2) agreement on education goals, criteria and strategies; and 3) two-way communication. This model, based on communication and interaction, lead to consider some other models accepted by the scientific community due to their relevance to understand and encourage collaboration among schools, families and the community in which they both interact.

ECOLOGICAL MODEL OF HUMAN DEVELOPMENT AND MODEL OF OVERLAPPING SPHERES OF INFLUENCE TO ENCOURAGE COLLABORATION BETWEEN SCHOOLS AND FAMILIES

Ecological Model of Human Development (Bronfenbrenner 1987)

The Ecological Model of Human Development by Bronfrenbrenner (1987) is based on the assumptions of the General Systems Theory by von Bertalanffy (1968) and the Field Theory by Lewin (1951) (Intxausti 2010). It is represented by concentric circles in constant interaction which refer to different systems or environments surrounding the individuals (ontogenetic system) and affecting directly and indirectly their development: family and school (microsystems), community environment (exosystem), general social environment (macrosystem) and reciprocal interactions between all of them (mesosystem) (Redding 2006). The microsystems of family and school exert the most influence upon the developing human being through their direct and active linking with them (Martínez and San Fabián 2002; Murillo and Krichesky 2015); the individuals learn within about beliefs, roles and standards on social, ethical and moral behaviour, that would allow them to get adapted to its internal functioning (Xu and Filler 2008).

What happens within these two microsystems and their interactions through the mesosystem, gains particular relevance regarding relations between schools and families. As stated earlier in this chapter, the way in which both agents are perceived and communicate with each other usually conditions the psycho-pedagogical practice, the education quality, and the academic results of the students (Epstein 2011; Portillo-Torres 2015). In respect to family microsystem, Nyarko (2010) claims that the parents involvement at home (parents support; rules establishment and compliance; personal and academic expectations; intellectual, cultural, and academic values; etc.) have a more critical impact on the academic progress of the child or adolescent than the activities developed by the families within the school. This is quite relevant if we consider the current scheduling constraints of most of the families to get involved within the schools, due mainly to employment issues (Rodríguez, Martínez-González and Rodrigo 2016). Nevertheless, Martínez-González (1992) claims that the parents' participation in the schools is important because it may be considered as a way of community intervention and involvement, as well as psycho-pedagogical support for the school, especially in cases of students with learning difficulties, academic failure, and dropout (Bermejo, Martín and Ayala 2006). In line with Rabusicová (2005), Rodríguez, Rodrigo and Martínez (2015) and Sreekanth (2010), the school-family cooperation positively correlates

with students' academic performance, social competence, and personal and group status improvement.

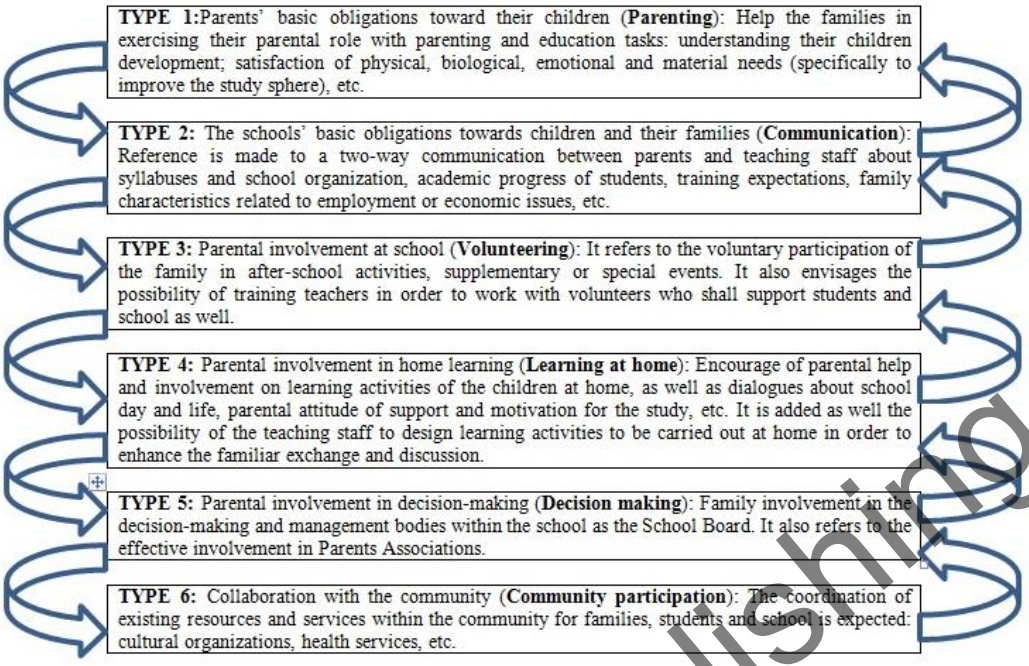
In this regard, a suggestion to encourage parental cooperation is to develop action-research studies with families to detect their needs for involvement and to organize actions accordingly (Constantino 2003; Martínez and Pérez 2006; Rabusicová 2005). Likewise, Álvarez (1998) empathises the interest of this cooperation to be carried out also with professionals from community entities as well (exosystem) such as the health system, social welfare, associations and other social or education institutions. The ultimate purpose is to build intersectoral networks in order to bring benefits to the whole education ecosystem (Azaola 2011; Castelli et al. 2011). This idea leads to consider the Model of Overlapping Spheres of Influence by Epstein (1990).

The Model of Overlapping Spheres of Influence (Epstein 1990)

Most of the research carried out at least in the two past decades about cooperation between family, school and community take into consideration the Model of Overlapping Spheres of Influence, proposed by Epstein (1990, 1995, 2011). This is a holistic approach to educational cooperation (Deslandes 2001) explained by the existence of three spheres —family, school and community— which, conceptualised as interaction and learning contexts, intertwine and overlap around a central space associated to the developing subject (student). This model underlines the need to conceive the school as a "learning community" where can be found "*educators, students, parents, and community partners who work together to improve the school and enhance students' learning opportunities*" (Epstein and Salinas 2004, 12).

In order for this to happen, three key aspects must be taken into account: a) consider the student as an active agent within the family-school relational process; b) recognise the relevance of teachers, parents and students to cooperate for the global benefit; and c) think about the forces which may push together or pull apart the families and the schools: time (Force A); characteristics, values and education styles of the family (Force B); and that of the school (Force C) (Deslandes 2001). The nature and sense of these forces would establish the quantity and quality of the collaborative activities. The aim of the model —to enhance complementarity, communication and cooperation between school, home and community— may be achieved by organising actions which Epstein (1990, 1995) classified in six typologies. These typologies are summarised in Figure 2:

This model emphasises the need to encourage the cooperation between schools, families and community entities given its positive correlation with learning and academic performance (Davies et al. 2007; Epstein and Sanders 2006; Fletcher and Silberberg 2006; Hiatt-Michael 2010) and its potential to prevent absenteeism, academic failure and dropout (Martínez-González et al. 2008; Symeou, Martínez-González and Álvarez 2012). The greatest potential of this partnership is achieved when its actions are performed from a proactive and preventive approach, not awaiting until learning difficulties or behavioural problems arise (Epstein and Sheldon 2002). From this proactive approach, the benefits of this partnership are visible not only among the students, but in their families, teaching staff and the school as well.



Source: Adapted from Epstein (2011) and Martínez, Rodríguez and Gimeno (2010).

Figure 2. Areas of Cooperation between School and Family.

BENEFITS OF THE COOPERATION BETWEEN FAMILIES AND SCHOOLS

The positive effects originated from the cooperation between families and schools have been mentioned by many researchers (Forest and García-Bacete 2003; García-Bacete 2003; Martínez 2004; Martínez-González and Paik 2004; Martínez, Rodríguez and Gimeno 2010; Pepe and Addimando 2010; Robledo and García 2011; Webster-Stratton and Reid 2010). These positive effects are extended to the whole education community and, especially, to the three agents directly involved in this partnership: the student, their family and the teaching staff. Table 3 summarises the contributions to this respect pointed out from different leading scholars in this area.

As can be seen in the Table 3, partnerships between schools and families are interesting and enriching. Therefore, it seems relevant the school to aware the families of the important role they play for reaching the education success of their children, the optimal performance of the family unit, and a satisfactory atmosphere at school and between parents and teachers. They hence become *efficient agents of educational practice* (Sreekanth 2010).

Table 3. Positive effects of family-school partnership

Positive effects of Family-School partnership		
Effects on the students	**Effects on the family**	**Effects on the teaching staff**
▪ **Improve the academic performance and reduce the academic failure**(Álvarez and Martínez 2016; Bakker and Denessen 2007; Epstein and Sheldon 2002; Fan and Chen 2001; García-Bacete 2003; Martínez-González et al. 2004; Martínezet al. 2009; Robledo and García 2009; Romero 2010) ▪ **Better attitude and motivation towards school and study activities**(García-Bacete 2003; Martínez 1992) ▪ **Greater access to postsecondary studies** (García-Bacete 2003; Robledo and García 2009, 2011) ▪ **Better school adjustment**(García-Bacete 2003) ▪ **Overall improvement of behaviour** (Bakker and Denessen 2007; Hornby and Witte 2010; Martínez 2004; Webster-Stratton and Reid 2010) ▪ **Increase of self-esteem**(García-Bacete 2003; Martínez 2004; Romero 2010) ▪ **Better social skills** ▪ **Improve intellectual level and linguistic skills**(Martínez 1992; Martínez et al. 2004). ▪ **Greater class attendance and less absenteeism**(Epstein and Sheldon 2002; Hornby and Witte 2010; Martínez 2004; Martínezet al. 2009; Robledo and García 2009, 2011)	▪ **Greater education and professional expectations upon their children**(Álvarez 2006; Torío, Hernández and Peña 2007) ▪ **Greater satisfaction with the parental role and the development of positive parenting skills**(García-Bacete 2003; Hornby and Witte 2010; Robledo and García 2009) ▪ **Greater perception of parental self-efficacy** (Davies and Johnson 1996; Hornby and Witte 2010; Martínez-González et al. 2016) ▪ **Better communication with their children, especially within school activities**(Robledo and García 2011) ▪ **Better attitude towards the teaching staff**(Álvarez and Martínez 2016; Martínez 1992) **and towards the education services** (Robledo and García 2009, 2011; Romero 2010; Symeou, Martínez and Álvarez 2012) ▪ **Motivation for culturally progressing in order to better help their children with their studies** (Hornby and Witte 2010; Nyarko 2010; Redding 2006) ▪ **Better appreciation of the organisation and functioning of the school**(Hiatt-Michael 2010; Martínez 1992; Murillo and Krichesky 2015) ▪ **Greater communication with the school, greater involvement within the school**(Hiatt-Michael 2010; Martínez-González, Rodríguez and Gimeno 2010) and other community institutions and measures (Martínez 1992) ▪ **Greater satisfaction with the relation between parents and children**(Anderson and Minke 2007; Castelli et al. 2011; Epstein 1990, 1995)	▪ **Better attitude towards the families** (Deslandes 2001; Hornby and Witte 2010; Martínez and Álvarez 2005) ▪ **Greater professional satisfaction and motivation to teach** (Deslandes 200; García-Bacete 2003), and better professional skills (Álvarez 2006) ▪ **Greater frequency and quality of mentoring for students**(Martínez 1992) ▪ **Greater efficiency and productivity labour performance**(Epstein 2011; Hornby and Witte 2010; Rivas and Ugarte 2014 ▪ **Greater personal commitment with the teaching-learning process**(García-Bacete 2003) ▪ **More student-centred curriculum**(Álvarez, 2006; Martínez and Álvarez 2005;Redding, 2000, 2006) ▪ **Greater assessment of teaching and social competences of teachers**(García-Bacete 2003; Hornby and Witte 2010)

Source: Own elaboration from a bibliographic review.

CONCLUSION AND SUGGESTIONS ON EDUCATIONAL PRACTICE

Bearing in mind the ideas and models mentioned along this chapter, it therefore seems advisable to reflect on the appropriateness of analysing how to establish the cooperation between teaching staff and families within the schools in order to identify needs, and encourage measures which meet these needs. Accordingly, the activities taking place and those potential activities that might be incorporated, the level of involvement, the determining factors, and the level of satisfaction reached may be reviewed. In this respect, it can be retrieved the methodological proposal of action-research presented by Davies and Johnson (1996) and Martínez and Pérez (2006), and studies carried out by Martínez et al. (2009) and Martínez, Rodríguez and Gimeno (2010), taking into account the six types of involvement proposed by Epstein (2011).

As a final conclusion, this chapter emphasises the importance that cooperation between family and school must be considered as a priority topic in education policies, educational projects and practice at school to improve the education quality, the academic success of students, and prevent from academic failure, absenteeism and dropout (Álvarez and Martínez-González 2016).

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Chapter 8

HOMEWORK AND ACADEMIC ACHIEVEMENT: STUDENT, TEACHER AND PARENT INVOLVEMENT

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ABSTRACT

Homework is a daily task in students' routine. However, it not only concerns students. Teachers and parents also have important roles to play in the homework process. Students' actions and success on homework depend on the quality and quantity of tasks teachers assign, the amount of time students spend doing homework, and their time management when working on an assignment. These variables are associated with academic achievement, but in different ways. Teachers select or design and assign homework to students, prepare students through class lessons, and follow up with students after the homework is completed. Some teachers correct and grade homework, whereas others do not. The feedback teachers give to students about their work may affect student attitudes about future assignments and academic achievement. Parents' actions to control or support their children's homework behavior and completion of tasks may affect student attitudes and their academic achievement. There are many kinds of parental support and control that promote positive and negative reactions from students. Although the debate about the value of homework always gets attention in the news, research continues to focus on increasing understanding of the roles of teachers, students, and parents in the homework process, and the results of homework on student achievement.

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Keywords: homework, academic achievement, involvement, teachers' feedback, parental involvement

INTRODUCTION

Homework is a topic of interest in education and, more broadly, in society. Homework refers to tasks assigned to students by teachers to be completed in non-school hours (Cooper 2001). This definition sounds simple, but researchers understand homework as a complex educational tool. There are variations in the quality of homework assignments, the quantity or length of tasks, participants and contexts, and the nature and results of the homework process (Cooper 2001; Cooper, Robinson and Patall, 2006; Corno 2000; Epstein 2011; Warton 2001).

A persistent concern is whether doing homework is beneficial or not for students' academic achievement. Many studies show that homework benefits students (Cooper 2006; Patall, Cooper, and Robinson 2008; Walker et al. 2004), by improving or reinforcing study habits, responsibility for learning, and attitudes toward school work (Corno 2000; Trautwein et al. 2006). Even students acknowledge that homework helps them to learn (Cooper 1989).

It is well known that one of the main purposes of homework is to give students an opportunity to practice and review content learned in class. Practice to increase mastery may help students retain knowledge, process information, and increase critical thinking. Homework helps parents learn about what their children are learning in class and this can strengthen school and home connections (Epstein and Van Voorhis 2001).

Homework also has long-term effects on students such as helping them learn more efficiently during free time, improve attitudes toward school, and strengthen study habits and abilities. One of the most often reported results of homework is to help students develop time management and study skills (Schunk and Zimmerman 1998).

In short, across studies, homework is shown to have direct and indirect effects on students' academic skills and on positive student behaviors such as self-discipline, time organization, curiosity, and problem solving skills (HMI for Education and Training in Wales 2004). Homework also increases parental involvement in students' learning (Cooper 2001). It is generally accepted that well-designed homework can have these combined effects on students and on parents, and should be assigned by teachers.

Some researchers highlight negative effects of homework on students and on contexts (Barber 1986; Kralovec and Buell 2001), such as increasing gaps in learning of high and low achieving students, decreasing motivation, increasing anxiety or boredom, and restricting students' free time for other activities (Bent-Hills 1988; Friesen 1979; and Muhlenbruck, Cooper, Nye and Lindsay 2000).

Still others suggest that homework can increase family conflicts, disrupt family daily life, or decrease their free time that parents and children have together (Jackson 2007; Marzano and Pickering 2007; Ohanian 2004). For example, students who lack good supervision may do the wrong assignment or do an assignment in the wrong way. Poorly designed assignments make students see homework as boring or busy work, which may affect attitudes toward particular school subjects (Cooper et al. 1998; Warton 2001; Xu 2004). Low-quality homework can damage students' short-term learning and long-term attitudes toward education.

In their studies, researchers have reported on the positive and negative effects of homework (Cooper 2001). Taken together, the knowledge base is clear that well-designed homework at appropriate levels of interest and challenge will help students practice, strengthen, and master skills and complete creative work (Epstein and Van Voorhis 2012). Despite countless studies that confirm that students who do homework do better than similar students who do not, there are lingering questions about which students benefit from homework, in which subjects, and how much. Studies of homework advantages and disadvantages in specific subjects and with diverse populations are needed to confirm or refute the emotional demands to reduce or increase homework.

This chapter summarizes research on the different roles of the key agents in the homework process—students, teachers, and parents. The extant studies also help identify gaps in knowledge for future research, and the development and evaluation of interventions based on key variables that positively affect the success of students in the homework process. In the first section, studies about student involvement in homework show different findings depending on what homework process variables are considered. Secondly, the section about teacher involvement in homework highlights the important role of teachers designing high-quality assignments, checking homework, and giving students feedback about their work. The last section, parent involvement in homework, summarizes the relevance of parents' roles on students' involvement in homework, the different ways parents may be involved in homework, and their different relationships with students' academic achievement.

STUDENT INVOLVEMENT IN HOMEWORK

In the past few decades, studies were conducted of many aspects of homework. The studies generated important results about the relationships of homework variables with academic achievement (Keith 1982; Trautwein et al. 2002). Recent studies added attention to the contributions of other variables, including students' cognitive abilities, motivation, and conditions under which homework is completed (Cooper et al. 2006; Marzano and Pickering 2007).

One new direction in studies of homework focuses on the student's role in the homework process (Pan et al. 2013). Topics include the student's interest, usefulness about homework, and work pattern (Trautwein et al. 2006; Hong and Milgram 2000), quantity of homework tasks done, time spent on doing homework, and homework time management (Núñez et al. 2013; Trautwein et al. 2002; Trautwein et al. 2009).

Trautwein et al. (2006) proposed a theoretical model of homework that combines elements of expectancy-value theory (Eccles and Wigfield 2002), self-determination theory (Deci and Ryan, 2002), and research on learning and instruction (Brophy and Good, 1986). In the Trautwein et al. model are three pillars that affect the assignment and conduct of homework -- teachers, students, and parents). The model predicts that students' achievement is explained in part by student involvement in homework. According to expectancy-value theory, student involvement is partly explained by motivational variables joined to homework (expectations and values) and these variables are partly explained by student variables, context variables and parental involvement variables. The *expectancy* component reflects the student's belief in being able to execute goal-oriented behavior successfully (Zimmerman,

Bonner and Kovach, 1996). The *value* component addresses question such as: How important is to do well in the domain in question (attainment value)? Does the student enjoy engaging in the activity (intrinsic value)? Does the student expect any benefit from the activity (utility value)? Does the activity require a high quantity of effort (cost)? Warton (2001) asserted that the utility and cost components are particularly important in the homework process.

This work suggests that the nature and extent of student motivation to do homework contributes to the relationship between homework completion and student academic achievement (Trautwein et al. 2006). A student's motivation is affected by teachers' instructional approaches in class (Rosário et al. 2010). Research on classwork suggests that students' motivation also is affected by approaches to and components of homework, including time management, time spent, and quantity of homework completed.

Students who are highly motivated to learn tend to do more to complete their assignments (Ryan and Deci 2000; Trautwein et al. 2006). In short, the student's motivation or personal interest affects the investment in homework assigned by teachers. In this way, students are central to their schoolwork, homework, and learning.

Studies have mainly reported that student motivation and self-regulated learning affect student learning and classwork. There is more to learn about the connections of student motivation, level of ability, and the homework process.

One promising direction builds on the results of studies of achievement when students exercize deep vs. superficial learning in class. Deep learning is the result of complex and challenging assignments that require close reading, attention to details, and creative thinking. Superficial learning occurs when assignments require passive attention and the ingestion and memorization of information.

When applied to homework, the contrast of deep vs. superficial learning may affect how much students learn by completing assignments. Bembenutty and White (2013) claim that positive results occur when students do homework based on deep learning and when students have high interest and positive attitudes about their work. Positive attitudes combined with well-designed and challenging homework assignments contribute to increased academic achievement in specific subjects (Núñez et al. 2014) demonstrated that students who experienced deep learning activities had higher academic achievement.

One early study suggested that the quantity of homework completed was more important for student achievement than the quantity of homework assigned by the teacher (Cooper et al. 1998). We suggest that this also may affect student motivation. In new studies, it will be important to be clear about the meaning of "quantity" in homework studies.

Generally, research confirms that students who do their homework get better marks than similar students who do not (Cooper 1989; Trautwein et al. 2002). Several studies use the quantity of homework done (as a proportion of the total homework assigned) as a predictor of students' academic achievement (Regueiro et al. 2015a; Regueiro et al. 2015b).

Time spent doing homework also has been studied as an influence on achievement. Data analyses confirm that more time spent on homework, especially in higher grades, has a positive effect on achievement (Keith, 1982). Others have pointed out that it is important to distinguish between quantity and quality of time spent (Núñez et al. 2013). This is complicated because it is difficult to systematically measure the quality of time on homework. Some have done so by measuring self-reports of whether students are focused or distracted while they complete homework (Núñez et al. 2013). Positive correlations of time spent on homework and academic achievement should be carefully studied because extra time may be

needed by students who have knowledge gaps or learning disabilities. A common homework assignment may take a quick-learner a few minutes and a slower learner many minutes to complete, creating a negative correlation between time spent and resulting student achievement.

Some studies have tried to unpack those relationships. For example, Trautwein and colleagues reported that students who spend more time on homework are not necessarily better or brighter students (Trautwein 2007; Trautwein, Lüdtke, Schnyder et al. 2006; Zimmerman and Kitsantas 2005). Some students need more time to focus on the assignment or get motivated. At the same time, these authors recognized that students effort on homework is not always related with time spent on those tasks. It seems, then, that the quality of homework (measured objectively) and the quantity of homework completed reported by students may be positively related to academic achievement. However, it is necessary to consider students' starting abilities and time spent to fully understand whether and how student achievement is affected by motivation to do homework, the quality of the assignments, time spent, and quantity of homework completed.

Looking across studies, students' homework time management or self-regulated behavior may play a more important role for increasing achievement than time spent on homework. This suggests that it will be important for researchers to measure how well students manage their time and the quality of assignments, rather than too-simple measures of time spent to fully understand students' participation in and results of the homework process.

Extent research on students' roles in the homework process indicate that future studies need to be deliberate in selecting variables to better understand specific processes and outcomes. There are many factors that affect the design and quality of homework that is assigned and whether and how students attack and complete their assignments. Researchers must be clear about which variables to measure to address new questions about student motivation, student behavior, and results on achievement.

TEACHER INVOLVEMENT IN HOMEWORK

Research is scarce in identifying details about teachers' roles in developing assignments that promote productive homework-related behaviors and positive results academic achievement for more students. In part, because homework has been traditionally considered an "out of school" task over which the teacher has no direct control (Núñez et al. 2014), it has been easy for researchers to avoid attention to the important role the teacher plays in developing, designing, and assigning homework.

Some attention has been given to teachers' feedback on homework after it is submitted and back in the school under teachers' control. Teachers' feedback to students on homework has been shown to be important for improving students' work and test scores (Cooper et al. 1998; Rosário et al. 2009; Warton 2001).

Teachers' provide guidance and feedback to students at two points in time. First, when the assignment is made, teachers may take time to explain the assignment and approaches that students should take. Then, after homework is turned in, teachers may review, correct and grade the work or provide other written or oral feedback. The results of teachers' feedback to students were reported recently by Trautwein et al. (2009), who found that students were

more likely to strive to do homework when they knew that the teacher will give feedback. Similar conclusions were reached in a recent study of a large sample of teachers from different countries (Murillo and Martínez-Garrido 2013). Results of that study showed that homework assignments may be counterproductive if they are not corrected in class to help students learn how to troubleshoot their errors and how to improve the quality and accuracy of their work.

Other studies explored whether teachers' written comments on homework were useful to students (Black and William 1998). In an early study, Walberg, Paschal and Weinstein (1985) found a positive impact of teachers' evaluations and comments on students' academic achievement. Others reported that students improved understanding and were able to correct mistakes if teachers provided feedback and corrections on homework.

An interesting study by Rosário et al. (2015) analyzed the effects of five types of feedback or follow-up on homework (i.e., checking homework completion; answering questions about homework; checking homework orally; checking homework on the board; and collecting and grading homework). In the study participated 26 teachers of English as a Foreign Language (EFL). They were randomly assigned to one of the five feedback interventions. Once a week for 6 weeks, the EFL teachers used the feedback/follow up strategy they were assigned. At the end of 6 weeks, students completed an EFL exam. The results showed that three types of homework follow-up practices (i.e., checking homework orally; checking homework on the board; and collecting and grading homework) had positive impacts on students' performance. Also, the effects were affected by students' prior knowledge. Students' prior knowledge contributed to the variations in the efficacy of each feedback strategy. For example, within the strategy of checking homework on the board, students with lower achievement gained more from the experience than did students who started at a higher level of achievement.

Cooper et al. (1998) point out that teachers are responsible for selecting the type of homework to assign to students, and to give examples or answer questions about the assignments before the students take them home. These authors guided teachers to design or assign homework according to students' ability levels to avoid making students bored (if too easy) or frustrated (if too difficult). Epstein and Van Voorhis (2012) summarized specific purposes for homework (e.g., practice, preparation for the next lesson, peer interactions, parent-child interactions, and others), and suggest that teachers identify the purpose of an assignment in order to design the activity for that purpose. By giving attention to the *design* of homework, teachers will know that the homework is meaningful, parents will see the value in homework, and students will improve their attitudes about taking time to do the work.

Results of research on teachers' roles in the homework process highlight the importance of designing motivating, high-quality assignments based on students' interests and abilities; conducting introductory discussions to clarify the assignments; and providing clear and useful feedback to students. These findings also suggest the need for organizing school-based training for teachers on these strategies.

PARENT INVOLVEMENT IN HOMEWORK

Parental involvement has been defined as "interactions between parents, schools, and children to promote academic achievement" (Epstein 1995; Hill et al. 2004). It can take many forms in all aspects of the educational process. Epstein identifies six types of involvement (parenting, communicating, volunteering, learning at home, decision making, and collaborating with the community), each with hundreds of practices that educators and families may activate to support student success in school (Epstein, 1995). Type 4, learning at home, includes homework, which others also agree is especially relevant to parents and to students (Katz, Kaplan and Buzukashvily 2011; Wilder 2014).

The peculiarity of homework is that is assigned to be done at home, away from teachers' direct supervision and in an environment where parents are supervisors. This gives parents an important role in the homework process. Not all parents get involved with their children on homework and not all who are involved do so in the same way. Most parents, however, consider helping students with homework as one of their responsibilities (Epstein and Van Voorhis, 2001; Hoover-Dempsey, Bassler, and Burow 1995) and believe that doing so will help improve their children's achievement (Epstein, 1986). Interestingly, most students report that when parents help them, they do more to study, complete homework, and perform better at school. When parents are involved, students report doing homework in a more efficient, effective, and focused way. However, the connections of family engagement in homework are complex, and relationships between parental involvement in homework and students' academic achievement are varied and influenced by numerous factors (Patall, Cooper and Robinson, 2008).

Most studies show that parental involvement in homework has positive effects. In an early study of the intervention to engage parents with children on homework (Teachers Involve Parents in Schoolwork - TIPS) in United States, it was noted that students in the middle grades significantly enhanced their writing scores (Epstein, Simon and Salinas 1997) if students conducted activities that required conversations with parents about language arts. Recently, quasi-experimental, longitudinal studies were conducted of the results of TIPS over two years in math (elementary grades) and language arts and science (middle grades). TIPS assignments required students to conduct interactions, interviews, experiments, and exchanges with parents. The studies indicated that at both the elementary and middle level and in all three subjects, students in TIPS classes has more family engagement, more positive attitudes about homework, and more positive learning outcomes (i.e., homework completion, standardized tests in math and language arts, and report card grades in science) than similar students in non-TIPS comparison classes (Van Voorhis 2011).

Other correlational studies also showed that traditional strategies of parental involvement in homework such as setting a time and quiet place for homework and providing help to students enhances achievement (Deslandes et al. 1999). Further, a meta-analysis of scores of studies reported positive effects of parental involvement on students' attitudes about homework and connections with academic achievement (Patall et al. 2008).

Other studies suggest that the type of parental involvement on homework is critical, including providing quiet space and materials for homework, interacting with teacher about homework, monitoring completion, making rules about when, where, and how to do homework (Hoover-Dempsey et al. 2001).

It is said that the most effective forms of parental involvement support the child's autonomy or self-direction and provide clear and consistent guidelines about completing homework (Grolnick and Ryan 1989; Pomerantz, Grolnick and Price, 2005). Cooper, Lindsay and Nye (2000) also found that parental involvement in homework in the form of children autonomy was associated with higher test scores, class grades and homework completion and direct aid was associated with lower scores and class grades.

It is clear that conflicts, control, and excessive pressure between parents and children about homework are negatively related to academic achievement (Karbach et al. 2013). By contrast, students' perceptions of strong support from parents is positively related to achievement, but students reported negative results when parental involvement was based on control and excessive pressure. Pomerantz et al. (2007) indicated four qualitatively different but dynamically related dimensions of parental involvement in homework: a) autonomy support vs. control, b) process vs. person focus, c) positive vs. negative affect, and d) positive vs. negative beliefs (about children´s potential). Lorenz and Wild (2007) on the other hand, proposed four different, but related, dimensions of parental involvement in homework: a) autonomy supportive practices, b) control, c) structure and d) emotional involvement.

In a recent study, Núñez, et al. (2015) identified two approaches (i.e., parental support and control) as the most relevant dimensions of involvement in homework and students' academic achievement. Parental involvement based on support provides students the appropriate environment to do homework and help if they need it during the process. On the contrary, parental involvement based on control puts pressure on students to do their work or punishes students if they do not do their homework. This adds a degree of conflict or hostility to the homework process. Núñez reported interesting results based on Spanish students' perceptions of parental involvement at the secondary school level. Specifically, results of this study showed that perceived parental control sustains a negative relationship with academic achievement, as was shown by other studies previously (Dumont et al. 2014; Karbach et al. 2013). Students' perception of parental support has a positive relationship with academic achievement, confirming and extending results in other studies (Cooper et al. 2000; Dumont et al. 2012; Pomerantz, Grolnick and Price 2005).

Studies of specific parental involvement variables (i.e., interaction with teacher, homework management, homework supervision, and homework correction) were linked to the quality of students' homework and the level of student achievement (Walker et al. 2004). Research also focused on the impact of parents' conceptions about their own involvement with students on homework. In a study conducted at the University of Minho, Portugal (Rosário et al. 2015), parents of 4th grade students were interviewed to better understand their views on parents' homework involvement. They identified three approaches: promoting autonomy, learning control, and learning incentives and three ways of parental involvement or strategies developed when involved (subsidiarity, collaboration and controlling emotions). In the first aspect category, *subsidiarity*, parents reported that, in order to help children to be autonomous in their homework, they should not do their children's homework. The second aspect category, *collaboration*, describes the willingness of parents to help the children to study, organizing the study environment and teaching them relevant learning strategies to complete their tasks. The last *how* aspect category, *controlling emotions*, is directly related to the parents' actions to cope with children's negative emotions while doing homework. These results extend those reported for students at the secondary school level (Lorenz and Wild 2007; Pomerantz, Moorman and Litwack 2007).

PROGRAMS TO IMPROVE PARENTAL INVOLVEMENT IN HOMEWORK

Most parents want to know how to help their children at home at each grade level. This type of involvement is most difficult for schools to organize. It requires clear and on-going communications by every teacher with all families about how to interact with their children on learning activities at home.

To meet parents' requests and to help them experience realistic and positive connections with their children on homework, researchers worked with teachers to design an intervention called *Teachers Involve Parents in Schoolwork (TIPS) Interactive Homework.* With TIPS, teachers can keep all families informed and involved in their children's learning in a particular subject throughout the school year and help students complete their homework (Epstein and Van Voorhis 2009).

Research on TIPS is reported above. In general, the intervention helps solve some important problems with homework:

- Enables all families to become involved.
- Makes homework the student responsibility and doesn't ask parents to teach subjects they are not prepared to do.
- Asks students to share and enjoy their work and ideas with their families.
- Allows families to request other information from teachers in a home to school communication.
- Measurably increases the number of parents who become engaged, improves students' homework completion, attitudes about homework, and skills.

With TIPS, homework becomes a three-way partnership involving students, families and teachers at the elementary, middle and high school level.

There are other homework interventions designed to help parents and students talk about schoolwork at home. Moll and his colleagues (Moll et al. 1992; González and Moll 1996) developed curricular approaches focused on students' cultural backgrounds. Families' "funds of knowledge" (Vélez-Ibañez and Greenberg 1992) are shared in the classroom and then linked to homework. For example, students could be asked to explore or apply a parent's fund of knowledge as if a student finds how a mom uses math in sewing (González et al. 2001), how workers in many occupations use reading and math to build a house (Mehan, Lintz and Wills 1995). These school-family-community connections help students see that, regardless of family racial, cultural, or linguistic backgrounds, families and neighbors have useful, interesting, and enriching skills that can make homework assignments more interesting.

Corno (2000) suggested that teachers could design homework to spark students' creative thinking, talents, community service, and problem solving. This may include projects done with a parent or family partner or with a friend instead of working alone. Students whose teachers guide writing projects in school may enjoy interviewing a family partner about topics for stories, poems, or commentaries on family events, photographs, and other home experiences.

Another approach is called *homemade homework* (Epstein 2011). Periodically, children and parents may design a family-related activity for homework. For example, students and

parents may elect to write a letter to a relative; draw or take a photo of something important to the family; plan activities for a family trip, review a movie or TV show, or consider other interesting activities to complete for homework. In this case, every student in a class would have a unique homework assignment. Research is needed to study how self-direction or subject specific skills are affected by this design.

The *home conference*, originally created by a middle school educator, is another potential design for improving the homework process and involving parents with students in productive ways. For a home conference, students select a few examples of their writing or other school work, read or discuss the collection with a family partner, and write a reflection on the suggestions or reactions they receive. A study of this practice would explore whether or how the student and/or the parent benefit from the discussion.

These and other innovative homework interventions require systematic development to show how these interventions can be implemented in schools and classrooms with diverse populations of students and parents. Research is needed to discover whether these interventions affect student homework habits and learning.

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Chapter 9

LEARNING DIFFICULTIES IN COMPUTER-BASED LEARNING ENVIRONMENTS

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ABSTRACT

Recent scientific literature shows the potential of computer based learning environments as tools for teaching and learning. At the same time, some difficulties have been found when college students face learning in computer hypermedia learning contexts. Lack of experience with virtual platforms, insufficient prior knowledge about learning contents, along with a lack of self-regulatory and metacognitive processes represent a set of critical obstacles that largely determine student performance. This chapter attempt to show the most relevant obstacles than students usually find when learning in a computer based environment. In addition, a review of some intervention programs is provided concluding that it is necessary not only to improve learners´ skills, but also the prevention of behavior derived from such difficulties, such as the procrastination or lack of academic integrity.

Keywords: CBLEs, higher education, learning difficulties, procrastination

INTRODUCTION

The knowledge delivered to the students through computer-based learning environments (CBLEs) is growing fast, especially in higher education: Society increasingly demands flexibility and access to education, at this regard, CBLEs are a key resource.

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A broad theoretical corpus shows that the learning that takes place in CBLEs is qualitatively different from the one that occurs in traditional classroom settings; hence, research and intervention also implies different procedures. Recent studies show that CBLEs require aditional demands and, in particular, a higher usage of metacognitive and self-regulatory processes. This chapter reviews the existing literature about this topic and addresses the impact of the new media in higher education at different levels.

HIGHER EDUCATION IN THE NEW MEDIA ERA

Virtual education arose as a result of the technological development occurred between the late twentieth century and the early twenty-first century. Many educational institutions incorporated CBLEs as a space for teaching and learning. As foretold by the European Commission for Education, Culture, Multilingualism, and Youth, usage of these learning environments will multiply in the next 10 years until reaching 30% of the global education supply (European Commission 2014).

This expansion turns down some of the constrictions present in traditional education (in particular, space and time constricts), making possible a ubiquitous education, developed anywhere at any time (Burbules 2012) and meeting educational demands of the new global society, whose economy is based on knowledge (Olssen and Petters 2005).

Higher education systems have taken advantage of this technology to expand their activity (Gaebel, Kupriyanova, Morais and Colucci 2014), not only with educational purposes, but also for institutional management and research. Traditionally, the e-university was seen as a complementary tool, but this point of view has expanded and currently is conceived as a core component of university education. The CBLEs have opened a world of possibilities that undoubtedly reflect a great diversity of institutions and experiences using them with educational purposes. However, in many cases, these educational settings are not properly designed, coordinated, or evaluated (European Commission 2014).

The diversity and evolution of CBLEs is not reflected in agreements upon their key concepts and terminology, despite the effort of existing international forums (e.g., Intelligent Management Systems Consortium, Learning Technology Standards Committee). This phenomenon is quite frequent in emerging research topics; therefore, it is necessary to try to delimit some concepts that will be present throughout the chapter and are frequently found in the existing literature:

With the term *hypermedia learning environments (HLE)*, we refer to a set of methods for instructional design that integrates text, video, audio, maps, etc. and enable interaction between user and content. The cornerstone is that students can access any resource in multiple sequences when learning with hypermedia, depending on various factors such as learning goals, prior knowledge or self-efficacy. Hypermedia has several defining characteristics that make it distinct from other CBLEs. The most significant is the non-linear presentation of information; the learner has a certain degree of control over the instructional sequence, thus students can actively participate in their learning process (Moos and Azevedo 2008).

Virtual learning environments (VLE) take their name from the Latin *virtus;* something that has the virtue to produce an effect without being present (Spanish Royal Academy of Language, s.v.). These scenarios employ hypermedia to promote learning, expanding its

potential thanks to enabling two-way, personal, and real-time interactions between the agents involved (system, course, teacher, students, etc.).

Both HLE and VLE are under the umbrella of the CBLEs (Moos and Azevedo 2009); this denomination simply refers to the information transmission channel and therefore encompasses these two and many other familiar terms, for instance, learning communities, open education, collaborative learning spaces, social networks or repositories.

Meanwhile, *e-learning* is nurtured by both HLE and VLE, and by the evolution of the web, to promote the construction of knowledge and its expansion. Although there is a lack of agreement defining elearning, Moore, Dickson-Deane, and Galyen (2011) summarize core components of this construct; use of Information and Communication Technologies (ICT) for teaching, covers both, content and instructional methods, and permit a bidirectional interaction between users and content.

Educational web platforms, also known as *e-platforms*, are virtual teaching-learning environments that integrate tools that permit the creation and management of so-called online education (e-learning) or mixed learning (blended) (Fernández-Pampillón 2009). These platforms, which currently allow applying a wide range of functionalities without requiring advanced computer skills, reflect the technological evolution of the last 25 years (Díaz 2013; Fernández-Pampillón 2009). Even the concepts used to refer to these technologies have evolved from ICT to learning and knowledge management technologies and technologies of empowerment and participation, frequently seen as simply LKMT and TEP. Correspondingly, there has been an evolution in learning environments that utilize these technologies, from the personal learning networks (PLN) to the personal learning environments (PLE) and personal learning and participation environments (PLEP) (Reig 2011). The PLEPs have emerged more recently, but are gaining strength because of their potential to promote social inclusion and an active citizenship, as reflected in the already mentioned UNESCO strategy for education in the twenty-first century (European Commission 2014).

In the university context, these platforms are named *virtual campus* and often enable additional functions (e.g., academic paperwork, institutional communication, etc.). Today, these e-campuses are widespread, since almost all universities use them as an alternative or supplement to classroom training (Gaebel et al. 2014). These platforms allow the development of a multitude of functions, among them administrating and managing learning environments (design, modification, or elimination of contents) and their users (enrollments, role assignment, management permits, etc.); synchronous (chat, video conference, electronic whiteboard, etc.) or asynchronous communication (e-mail, calendaring, forums, etc.); content management (allowing creation, storage, visualization, organization, modification, and sharing); group management (enabling collaborative work and learning); evaluation (allowing not only the assessment of student learning and participation using automatic reports, records, and tests, among others, but also the course evaluation using activity reports, questionnaires, and surveys) (Fernández-Pampillón 2009); and scientific research thanks to emerging disciplines, as for example educational data mining and learning analytics (Cerezo, Sánchez-Santillán, Paule-Ruíz and Núñez 2016; Paule-Ruiz, Riestra-Gonzalez, Sánchez Santillán and Pérez- Perez 2015).

After shedding some light on the confusing terminology, the next section will focus on the challenges involved this new scenario, regarding the different agents implicated in the teaching-learning process.

LEARNING DIFFICULTIES IN COMPUTER LEARNING ENVIRONMENTS

Everyone Apart from the Students

The United Nations Organization for Education, Science and Culture (UNESCO) advocates for the information and communication technologies not only as the optimal educational setting for the XXI century, but also to facilitate the full participation of the population in the knowledge society. United Nations Institute for Training and Research try to spread the usage of these environments through policies, projects, training, publications, and strategic plans.

Meanwhile, although in Europe almost every university has made good progress establishming these systems, their development and successful implementation has been uneven: A survey conducted by the European University Association shows how only 13.8% of the surveyed institutions (N=249, 38 European educational systems) integrate their experiences of virtual education into institutional planning and regard national policies (Gaebel et al. 2014). The report also reflects the differences between different types of institutions and countries, noting no marked trends and warning about the need to improve these practices.

Despite the potential of these new instructional models, their development in Europe has been slow and uncoordinated: The available methodologies, resources, tools, and educational contexts added up to non-existence of compulsory standards, limiting their scope (European Comission, 2014). In order to resolve this problem and respond to the increasing demand of Higher Education, the European Commission has launched the Opening Up Education Initiative, which provide support to universities in this sense, facilitating this necessary educational transformation (strategy Europe 2020).

As an example, since 2011 Spain has been developing several initiatives aiming to integrate ICT in higher education: The Spanish government, in the framework of the strategy University 2015, has encouraged improving these neccessary infrastructures for the virtual learning through the creation of the International Campus of Excellence. Other example of the Spanish comitment to the ICT integration is reflected in new requirements for the creation of new universities (Royal Decree 420/2015), making mandatory to enable virtual infrastructures aimed to give support to learning. However, although higher education institutions are making an effort to coordinate their practices and research in this regard, they should learn from (and take part in) organizations such as the IMS Global Consortium and the International Standards Organization that work to develop knowledge and establish agreements about standards of e-learning design (Fiesen 2005).

In summary, the aforementioned features of VLE multiply the potential educational and scientific impact of higher education institutions, but also become a challenge. We have highlighted the demands of this educational setting for the institution, but its requirements can also be difficult to achieve for staff members; Moving from traditional classroom learning environments to virtual environments is a challenge not only for students, but also for teachers (Chakraborty et al. 2015). Teachers and professors will see how not only their mastery of the subject, but also their technological, organizational, and communication skills are tested on a daily basis while working in VLE. For instance, given the isolation and

loneliness that may arise in the virtual student (Abovsky, Alfaro and Ramirez 2012) and the broadly studied importance in traditional learning environments (Tinto and Pusser 2006), it is necessary to pay attention to the role of the teacher and his or her willingness to establish appropriate communication processes with students (Chakraborty and Nafykho 2015). However, although access to university lecturing in Spain require digital literacy, do not guarantee or promote that teachers develop their skills in this regard.

Even though teachers, professors, administrators, institutions, and every agent implicated apart from students have an important role in the computer-based learning process, the truly main characters are the learners. In the following lines, the main learning difficulties associated with the specific use of computer environments as learning contexts are addressed.

Students' Learning Difficulties in Computer-Based Learning Environments

When Students' Believes Interfere in the Learning Process

When students face a learning task, not only their knowledge, skills, and previous experiences come into play, but also their less rational side plays a role. In this sense, the literature already highlights how epistemological believes (EBs) affect learning and performance (Garcia, 2005, Medrano, Galeano, Galera and Valle 2010; Trevors, Feyzi-Behnagh, Azevedo and Bouchet 2016).

Hofer and Pintrich (1997) refer to EBs as beliefs about the nature of knowledge and knowing held by each individual. These philosophical thoughts can meddle in the way of interact with knowledge, for instance, viewing knowledge as static may not help to question old fashin theories.

Stahl and Bromme (2007) identify the relationship between students' EBs and educational outcomes; They results highlighting how appropriate EBs may result in a better use of learning strategies, engagement, and academic performance. In contrast, irrational beliefs are related to a poor academic performance and dropout (Medrano et al., 2010).

In the same line, Bromme, Pieschl and Stahl (2010) summarize the most relevant results on the influence of EBs in learning processes, recognizing that they are often linked to metacognitive processes and, in particular, to those developed as part of the self-regulation processes. These studies confirm that certain types of EBs can contribute to better and more self-regulated learning (SRL). But probably one of the most crucial findings is that the plasticity of these EBs make it possible to model them through the appropriate educational intervention. (Kienhues, Bromme and Stahl 2008).

Trevors et al. (2016) looked into this construct in detail, examining epistemological cognition in CBLEs and finding that students with a constructivist epistemological cognition adapted better their learning processes (cognitively and metacognitively) than those who did not manifest this kind of thinking. Although CBLE are a privileged environment to study EBs and its relation to learning, metacognition, and SRL, this process is difficult and expensive, because of the amount and complexity of data (Greene, Muis and Pie 2010).

Thus, previous research gave proof of the need to broaden the research and take into account the different types of beliefs that can limite students´ performance in computer-based educational settings. But learners progress in CBLEs do depend exclusively on EBs, also SRL strategies and metacognition are crucial as will be shown in the next section.

Self-Regulated Learning and Metacognition: The Key to Success in CBLEs

CBLEs have a strong effect on knowledge acquisition, as reflected in the recent special issue of 25 Years of Knowledge Acquisition by E. Motta (2013). Empirical cognitive science and computer science research are addressing this subject from different perspectives (Azevedo and Aleven 2013). However, there is abundant empirical evidence that suggests that learners do not successfully adapt their behavior to these advanced learning environments (Azevedo and Feyzi-Behnagh 2011), or they do not do so at the same level or efficacy as in traditional educational settings.

Compared to class-based education, Computer-Based Learning Environments require to students additional effort when deciding what, how, and how much to learn, how much time to invest, when to abandon or change learning strategies, when to increase effort, etc. (Azevedo, Cromley, Winters, Moos and Greene 2005). In other words, learning in CBLEs requires higher SRL demands and involves a complex cycle of cognitive and metacognitive processes that impact students' learning. Additionally, in order to learn something new, the student must have the abilities, knowledge, strategies, and skills needed but also the willingness, intention, and motivation (Núñez 2009). Both are especially important when we face learning in computer-based environments, where the effectiveness of the study process will depend on the students' ability to self-direct and self-manage their cognition and motivation, in summary, to self-regulate their learning (Azevedo and Cromley 2004).

So, self-regulating learning can be defined as an active process where learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment (Pintrich 2000).

Within this construct and, as a step prior to the development of a SRL (Efklides 2008), metacognitive activities also carry out an essential role; Metacognition refers to the ability to reflect upon, understand, and control one's learning (Schraw and Dennison, 1994). It contributes to learning in several ways, but especially by helping learners to use their attentional resources more efficiently, to process information at a deeper level, and to monitor their performance more accurately (Schraw, Wise and Roos, 2000). Moreover, it is particularly important in computer-based learning because students need to deploy several metacognitive processes to determine whether they understand, what they are learning, and perhaps modify their plans, goals, learning strategies, and efforts in relation to dynamically changing contextual conditions (Azevedo et al., 2012).

Plenty of works have studied the importance of metacognitive processes in CBLEs. For example, Chang (2007) studied in a sample of 99 university students the relationship between metacognitive capacity and performance through an online English course. Students were divided into two groups: an experimental group (that participated in a metacognitive skills web training program) and a control group. The author found that regardless of the level of English, the metacognitive capacity achieved by the experimental group had a major effect on their performance and motivational beliefs compared to the control group. The author concluded that the development of metacognition could help increase the success of online learning.

In the same sense, Broadbent and Poon (2015) conducted a meta-analysis that revealed that metacognition strategies, along with time management, effort regulation, and critical thinking, are positively correlated with academic performance.

In addition, Cho and Shen (2013) aimed to examine the role of SRL through multiple constructs: orientation toward the goal of learning (intentions, purposes) and self-efficacy (confidence in their own abilities), mediated through metacognitive regulation (planning, monitoring, reviewing, and evaluating learning) and effort regulation (level of responsibility). To test the conceptualization of the above variables, they sampled 64 students enrolled in an online course. The results revealed a positive correlation between academic self-efficacy, goal orientation (intrinsic), metacognitive self-regulation, and effort regulation with academic performance. The authors particularly emphasized the importance of SRL and metacognitive influence in the academic achievement of students.

Despite these results, learners of all ages struggle when learning about complex contents in CBLEs; as mentioned, learning with CBLEs is particularly difficult because it requires students to monitor and regulate several aspects of their learning (Azevedo, Behnagh, Duffy, Harley and Trevors 2012). Bol and Garner (2011) broadly discuss examples of how the demands of CBLEs puts students with self-regulation difficulties at risk of failure and how poor SRL skills and inadequate calibration capabilities are areas of particular difficulty in which support might be most needed.

Not every student has or is able to efficiently deploy metacognitive and self-regulatory skills; in fact, the inefficient use of cognitive strategies and metacognitive processes, along with the lack of prior knowledge about the content, cognitive load of learning materials, and limited experience in these learning environments, are some of reasons for students to have difficulties within hypermedia environments (Azevedo and Witherspoon 2009).

A good number of works go in-depth in examining this phenomenon. This theoretical corpus contributes to reduce what could be called the collateral damage of CBLEs but to assess the efficacy of the improvement measures that are being implemented.

In this regard, Moos and Azevedo (2008) examined a sample of 49 college students with different levels of prior knowledge and their relationship between the domain of this knowledge and the self-regulatory process. All content was displayed on a virtual platform, and data were collected through think-aloud protocols (planning, use of strategies, etc.). Results indicated that prior knowledge was significantly related to how participants self-regulated their learning; in particular, prior knowledge was positively related to the metacognitive strategy of planning and monitoring. For these authors, the presence of prior knowledge frees the burden of working memory with a consequent gain in self-regulatory processes. However, processing of new information may involve additional effort that can limit the deployment of student self-regulatory processes.

Regarding palliative measures, another study provided by Azevedo, Cromley and Seibert (2004) examined in a sample of 51 college students the role of different educational scaffolding aiming to facilitate the understanding of a topic delivered through a virtual learning platform. They were randomized to three conditions, that is, without scaffolding, with fixed scaffolding, and with adaptive scaffolding. Students belonging to the condition of adaptive scaffolding were provided with a tutor who helped them plan objectives, monitor and understand their learning process, implement different learning strategies and manage difficulties. In the condition of fixed scaffolding, they were provided with a list of 10 questions related to the content that allowed them to guide and check their study. Finally, students in the third group (without scaffolding) did not have any help. The results showed not only that the students under the adaptive scaffolding condition performed better compared

to the other two groups, but also that those who did not have the tools for self-regulation (fixed scaffolding and without scaffolding) had difficulties regulating their learning process.

Additionally, Quintana, Zhang, and Krajcik (2005) attempted to examine the problems associated with metacognitive activity during online inquires of university students. They distinguished between three types of inquiries: (a) understanding the tasks and setting a schedule; (b) regulating and monitoring the above action; and (c) reflecting on the whole process. Regarding the first category, problems allude on the one hand to a lack of analysis about the concrete task goals, and on the other hand to an inefficient use of a structure to effectively solve the task. Regarding the second category, among others, problems include misdistribution of time or rephrasing the task question. Finally, the problems associated with reflection inform, for example, about the lack of a plan before beginning the activity or the absence of reflection about reading and whether it is relevant to their learning plan.

Other Difficulties

The use of CBLEs has grown exponentially in the last years, particularly in higher education (Romero, Espejo, Zafra, Romero and Ventura 2013). However, computer environments remain unknown to a proportion of the population that does not have access to this media. Apart from this issue, students may suffer additional difficulties when they initially attempt to learn in these contexts. Users' previous experience with technology and, more specifically with CBLEs, crucially influences their performance (Volery and Lord 2000); therefore, teachers need to identify these students and help them overcome their difficulties. Kan-Min (2011) delved into this variable in relation to progress and persistence in distance computer-based studies, finding that the previous experience plays a role in the intention to persist in this kind of educational setting.

In addition to this, O'Neil et al. (2004) states that previous experience in the use of educational technology is one of three critical factors to ensure not only the student's success, but also the teacher's and the institution's. The other two factors are the technological infrastructure and the teacher efficacy using of this technology.

In addition to the outlined difficulties, the discrepancy between teaching and learning styles in CBLEs may mean additional difficulties in the learning process. For example, in testing an online learning environment equipped with tools to improve SRL processes, Peñalosa and Castaneda (2007) found that some students showed resistance to e-learning, expressing the need for face-to-face teaching to assimilate the content. Currently, these kinds of discrepancies and individual features are being taken into account in instructional design, giving way to still-emerging solutions like adaptive learning environments (ALE) (Towle and Halm 2005), adaptive hypermedia systems (AHSs), and adaptive educational systems (AESs) (Brusilovsky 1996; De Bra and Calvi 1998). These environments enable different ways to access knowledge and learn, automatically customizing the learning scenario basing the adaptation on information previously registered by the CBLE.

One of the most common and basic difficulties that could entail learning at CBLEs is the sense of isolation and/or loneliness. We cannot ignore that most of the time, the learner is physically alone in a literal, but also figurative, way when facing learning. Despite the fact that nowadays there are available communication and collaboration tools that can help to mitigate this handicap, both teachers and students do not use them as much as demand them (Padilla and Hernandez, 2012). This fact favors the emergence of loneliness and isolation feelings that can lead to demotivation of students (Olsson, Mozelius and Colin 2015) and

even favor course dropout (Jun 2005; Olssen et al. 2005). Not surprisingly, although the CBLEs have generally incorporated communication tools that contribute to minimize these effects (mail, chat, forums, integrated social networking, RSS, etc.), the greatest potential to help overcome these problems is often attributed to the role played by the teacher (Chakraborty et al. 2015).

In the previous paragraphs, we examined the difficulties that a student faces when learning in a CBLE. We focused on the most remarkable ones, but, as happens with face-to-face learning environments, many others influence the process and results; for example, variables such as age, gender, or economic status have proven to influence academic performance in CBLE. Other problems arising from learning in these environments are related to dishonest academic behavior, which includes plagiarism, cheating on exams, and identity supplantation (Azulay, Barnesa and Gilleland 2014). There are existing solutions, such as providing students with information about the standards of academic integrity in the syllabus, but also researchers are designing actions to fight against this and test the usefulness of programs that aim to prevent this type of behavior (Azulay et al. 2014).

CONCLUSION

Since the birth of CBLE in the 60s, these learning environments have undergone a great transformation from hypermedia environments to advanced adaptive systems, or massive learning platforms. Research has mainly focused on the technical development of these learning environments; however, it has not paid the same attention to the potential difficulties that can arise when students work in these environments (Azulay et al. 2014).

The requirements of autonomy and self-regulation that CBLEs demand (Azevedo and Cromley 2004), although mediated by the influence of other variables, oblige educational agents to take care of the pedagogical design of these scenarios lined with the proposals of Duffy, Lowyck and Jonassen (1993) and Mayer and Moreno (2002).

It is noteworthy that entering to higher education does not mean to be able to effectively self-regulate learning and, therefore, be prepared for the demands of most of the CBLEs (Azevedo, Jobson, Chauncey and Burkett 2010). However, the literature highlights the potential for training in metacognitive skills and self-regulation (Cerezo et al. 2009; Graesser, McNamara and VanLehn 2005; Veenman 2007) to detect and prevent learning difficulties (Bogarín, Romero, Cerezo and Sánchez-Santillán 2014; Cerezo, Sánchez-Santillán, Paule-Ruíz and Núñez 2016; Sanchez-Santillan, Paule-Ruiz, Cerezo and Alvarez-Garcia 2015).

Given the above synthesis of research findings, we conclude that intervention programs aiming to promote better general academic performance and SRL in the university population are highly recommendable, especially if we take into account that the previously described difficulties tend to bring other associated problems.

Moreover, regarding that the schools and universities of today have to prepare their pupils to live in a society where technology is a fundamental tool, educational research must guide the transition of such an environment to virtual or mixed learning communities. Basing CBLE pedagogical design on scientific knowledge has proven to conduct effective interventions that minimize the learning difficulties of students. Preventing and correcting

learning difficulties in this educational setting is fundamental, as when a student is not able to overcome them, this increases his/her probability of withdrawal (Tyler-Smith 2006).

Also, it is necessary to support teaching: Chakraborty et al. (2015) identified the specific problems of the teaching profession in CBLEs and proposed a series of strategies to overcoming them. For example, in order to promote discussion in forums, teachers can ask students to reply to a classmate twice a week or ask them to relate their comments to learning material or their personal experiences.

Finally, we cannot ignore that computer learning environments are also challenging for institutions, as they need to ensure a continuous improvement process of their virtual campuses in order to respond to new neeeds.

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Chapter 10

LEARNING DIFFICULTIES IN MATHEMATICS: AN INTERVENTION PROPOSAL

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ABSTRACT

Mathematics learning difficulties (MLD) have a high prevalence within the child population. However, numerical abilities such as mathematics competencies and word problem solving are essential parts of the daily routine. In this chapter, first we present a brief description of the difficulties of students in mathematics, both in competencies and word-problem solving. Second, we introduce some of the interventions developed in this area for improving mathematics competencies. Finally, we describe in more detail a specific intervention strategy called *integrated dynamic representation* (IDR), for enhancing the early learning of basic mathematical competencies and word-problem-solving skills. IDR is a computerized strategy addressed to students aged between 3 and 8 years old. Taking into account that knowledge is constructed by means of a discontinuous flow of textual and audiovisual information by dealing with the three types of representation (iconic, combined, and symbolic), IDR can be implemented from early childhood education, even before students master lexical processing. This chapter presents and discusses the implementation of the strategy and its methodology.

Keywords: mathematics, intervention, integrated dynamic representation, word-problem solving

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INTRODUCTION

Mathematics is a critical component of our core curriculum and is vital to success in today's workplace and in everyday life (Giffin and Jitendra 2009; Kingsdorf and Krawec 2014; Krawec et al. 2012; Wilson and Dehaene 2007). According to Kucian and von Aster (2015), numerical abilities such as mathematics competencies and word problem solving are essential in daily routine, and they are becoming even more crucial with the increasing role of technology in contemporary society. However, as reflected in international assessment reports, many children experience difficulties in learning basic skills in mathematics, which can range from mild to severe numeracy problems (Käser et al. 2013; Kaufmann and von Aster 2012; Montague 2011). Also, these skills are more demanding for students with mathematics learning difficulties (MLD). In this regard, it is crucial to note that approximately 20% of the general population has low numeracy skills (Kadosh et al. 2013), and (depending on diagnostic criteria) 3 to 13% of people are considered to have more serious specific disabilities in relation to numbers (Butterworth 2010; Kadosh et al. 2013). Specifically, according to the *DSM-5* (Diagnostic and Statistical Manual of Mental Disorders), a prevalence of 3-7% is detected for deficits in mathematics in childhood (APA, 2013).

This incidence highlights the importance of understanding the educational profile of students with MLD (both in mathematics competencies and word-problem solving) and the strategies developed for improving these difficulties. These ideas are elaborated below.

MATHEMATICS COMPETENCIES IN MLD

Students with MLD constitute a heterogeneous group (Bartelet et al. 2014) that experiences severe difficulties in absorbing arithmetic facts into long-term memory and in using strategies to solve arithmetic problems (Jitendra et al. 2015; Rousselle and Noël 2007). The key problems in mathematics competence affecting students with MLD are believed to lie in their abilities to comprehend, assess, and then apply mathematics in a variety of contexts in order to solve problems in everyday situations in which mathematics plays a key role (Boesen et al. 2014). According to Geary (2003), MLD manifests itself in problems that require the student to apply different cognitive skills. First, MLD is characterized by a semantic memory deficit that generates difficulties recovering data and mathematical responses, more errors, and the need for more time to perform each task. Secondly, a procedural deficit results in difficulties retaining information, using working memory, and monitoring or controlling counting processes. Thirdly, deficiencies in the visuo-spatial area cause difficulties in number representation of relations and in the interpretation and comprehension of spatial information. All of these affect the specific competencies required to calculate and to learn algorithmic and heuristic procedures. Students with MLD do not remember certain number combinations and patterns, so they frequently have trouble with numeric manipulation and linguistic interpretation when solving certain types of problems (Montague and Jitendra 2006).

All in all, these students present deficits in basic mathematical competencies and specific problem solving, and such deficits should be detected and assessed in order to receive early

intervention, especially because students experiencing MLD will likely continue experiencing these difficulties throughout their later school years. In this sense, persistently struggling in mathematics is considered a defining characteristic of mathematics learning disabilities, one that suggests a biologically based disorder (Geary 2011).

Furthermore, these difficulties are present as early as kindergarten, when students have already been exposed to a large base of informal knowledge in mathematics (the *informal competencies*, e.g., perception of small numbers, quantity perception, enumeration of 1 to 5), defined as knowledge that is not taught during formal schooling but that is intuitive or is built up through everyday experiences (Libertus, Feigenson, and Halberda 2013). As students progress through the early elementary-school years, their informal mathematics skills and competencies serve as a platform for the acquisition of formally taught mathematics concepts (the *formal competencies*; Ginsburg and Baroody 2003). However, children start kindergarten with different preschool levels of mathematics ability (Purpura et al. 2015), and these differences often predict their later achievement (Aunola et al. 2004; Bailey et al. 2014; Purpura, Baroody, and Lonigan 2013; Ryooa et al. 2015).

Students with fewer informal knowledge skills, such as students with MLD, have a great disadvantage relative to their peers (Jordan, Glutting, and Ramineni 2010) and exhibit large deficits and greater difficulties with word problem solving. All in all, students with MLD must deal with substantial deficits in basic mathematical competencies and specific problem solving skills. Those deficits need to be detected, assessed, and intervened in, especially as it has been reported that approximately 20% of people have low numeracy skills, and (depending on diagnostic criteria) 3 to 13% of people are considered to have more serious specific disabilities in relation to numbers (Butterworth 2010; Kadosh et al. 2013).

Tests such as the *Test of Early Mathematics Ability* (TEMA-3; Ginsburg and Baroody 2003), the *Test Diagnostique des Compétences de Base en Mathématiques* (TEDI-MATH; Grégorie, Noël, and Van Nieuwenhoven 2001), and the Utrecht Early Numeracy Test (ENT; Van de Rijt, Van Luit, and Pennings 1999) can be used to assess mathematics competencies. The TEDI-MATH is a test designed for the diagnostic assessment of mathematical disabilities and evaluates five facets of numerical competence: logical knowledge, counting, representation of numerosity, knowledge of the numerical system, and computation. The main purpose of the ENT is to identify children aged between 4 and 7 years who are suspected of a delay in preparatory mathematics knowledge. The test takes a developmental perspective on children's number sense and aims at tapping eight aspects of numerical knowledge, including the concepts of comparison, classification, one-to-one correspondence, seriation, the use of number words, structured counting, resultative counting, and general understanding of numbers.

On the other hand, the TEMA-3 is designed to assess children aged 3 years to 8 years 11 months. The TEMA-3 is an adaptive test that is finished when the students have five consecutive errors. The test consists of 72 items aimed at assessing mathematical competence, distinguished between informal (41 items) and formal competencies (31 items). The informal competencies are structured around four subtests: *Counting* (a basic skill for representing quantities and for mental calculation), *Quantity comparison* (a basic skill for manipulating the order of numbers—increasing/decreasing), *Informal calculation* (a basic skill for solving addition and subtraction operations), and *Informal concepts* (a basic skill for grouping aggregates, with their manipulation implying the conservation of material). Similarly, the formal competencies are also structured around four subtests: *Conventionalisms* (the capacity

to read and write quantities), *Number Facts* (the capacity for mental mathematics operations—addition, subtraction, and multiplication), *Formal Calculation* (the capacity to carry out increasingly difficult addition and subtraction), and *Formal Concept* (the capacity to identify numeric meaning from symbolic and iconic representations). Moreover, the instrument provides a standardized general coefficient, the Mathematical Ability Score (MAS; $M = 100$; $SD = 15$). According to the examiner's manual (Ginsburg and Baroody 2003), the two-week test-retest reliability of the TEMA-3 is .82, and the Cronbach's alpha for participants aged 6, 7, and 8 years is equal to .95 in each case.

WORD-PROBLEM SOLVING IN MLD

The difficulties that students with MLD present in mathematics competencies are also manifested in their struggles in mathematics word-problem solving. In relation to word-problem solving, Montague, Enders, and Dietz (2011) note that problem solving is a process in which it is necessary to implement strategies to understand and interpret the initial statements through internal representations that capture the different proposals and their semantic relations, and to elaborate a situated model (Orrantia 2003; Orrantia et al. 2012: Timoneda et al. 2013; Vicente, Orrantia, and Verschaffel 2008).

In this sense, many problem-solving models have been proposed (Krawec et al. 2012; Lazakidou and Retalis 2010) to help students develop their reasoning skills. In relation with theoretical models, two prominent models are the Stenberg's and Montague's models. The model proposed by Stenberg, following the lead of Lazakidou and Retalis (2010), differentiates math acquisition by breaking it down into a series of steps: definition of the problem, construction of a strategy, organization, assignment of resources, follow-up, and assessment of the solution. Montague, Enders, and Dietz (2011) also distinguished the initial representation and subsequent performance as the main phases of problem solving. The first phase, representation of the problem, consists of translating and transforming the linguistic and numeric information into verbal, graphic, and symbolic representations that reveal the relations between the parts before generating the mathematical equations or algorithms for subsequent performance. The second phase, performance proper, requires identifying, analyzing, and applying the corresponding calculations, as well as testing their accuracy. Students with learning difficulties lack the knowledge of these representation processes, so it is considered necessary to teach them explicitly (Montague et al. 2011).

These models have been adapted in application or procedural models such as Montague's model and Mayer's model. The model put forward by Montague (2011) is based upon these two main stages, while also taking into account the model of Krawec as further reference. This model establishes a metacognitive intervention strategy based upon a seven-step process, namely to read the problem, paraphrase or rewrite it in one's own words, visualize or represent it in a graph or diagram, establish a hypothesis, estimate or predict the result, perform the calculations, and then test the result.

However, despite the great variety of reported models, problem solving is more than the simple application of a set of automatic mechanisms (Lazakidou and Retalis 2010). This skill should be accompanied by a series of associated thinking strategies that are essential for the development of reasoning and problem-solving skills (Montague, 2011). According to

Jitendra, Dupuis, and Zaslofsky (2014), the development of general problem-solving skills is facilitated by opportunities for solving word problems. Word problems can help students to connect different meanings, interpretations, and relationships concerning mathematical operations (Van de Walle 2004). However, the instruction of this ability is often relegated to later grades of schooling, where these foundational concepts are assumed to have been already mastered (Kingsdorf and Krawec 2014). In this sense, Mayer's (1985) model provides a clear description of the processes underlying mathematics word-problem solving, but not the requisite skills necessary to carry out those processes. Regarding these processes, Mayer's model identifies four phases: translation, integration, planning, and execution. According to Kingsdorf and Krawec (2014), the translation phase is related to linguistic and factual knowledge and requires the skill of "number selection" to solve word problems. The integration and planning phases, which involve knowledge of schematic representation and strategic planning, are essential to determine which operations to use and the number of steps required. The execution phase, which is related to algorithmic knowledge, is strongly linked to overall computational skills. To carry out these processes, it is necessary to implement a combination of competencies. Thus, an intervention in word-problem solving must include these processes and skills in order to efficiently enhance informal and formal competencies.

In this sense, schematic representation is an effective strategy that can greatly enhance these processes. Representational ability has been shown to be critical for the development of mathematical intuition (Pape and Tchoshanov 2001; van Garderen, Scheuermann, and Jackson 2012). There are a number of different representational systems, (such as mental images, written language, oral language, action movements, and symbols; Zawojewski and Lesh 2003). Although all representational systems are important for the development of an understanding of mathematical concepts (Pape and Tchoshanov 2001), rigid visual presentations of mathematical equations are commonly used and recommended for mathematics instruction at all grade levels.

INTERVENTIONS IN MATHEMATICS

Taking into account these keys described in the theoretical models, different interventions with different goals (depending on the grade level) are used to enhance mathematical skills. For example, programs that are designed for preschool children mostly focus on building basic numerical skills (Engel, Claessens, and Finch 2013), whereas elementary school training targets a far broader range of skills (Kucian et al. 2011). Also, when taking into account that the development of each child's numeracy abilities may follow a different trajectory, a high level of personalized intervention is crucial. Consequently, adaptive educational computer-based training has been shown to meet these requirements and is often used to improve such skills (Kadosh et al. 2013). Nonetheless, according to the aforementioned authors, only a few computer-based training programs have been evaluated scientifically.

In this respect, although prior research highlights the importance of previous mathematics competence in relation to later achievement, mathematical learning is under-emphasized in the first years of school. For example, kindergarten teachers spend little time on mathematics instruction and only cover very basic content, such as counting and shapes (Bargagliotti,

Guarino, and Mason 2009; Engel et al. 2013). However, the building of mathematical knowledge is hierarchical, inclusive, and integrative (Bailey et al. 2014; Cueli et al. 2016; Olkun, Altun, and Deryakulu 2009). Given the long-lasting effects of difficulties in mathematics, it is necessary to implement strategies aimed to reduce these problems. In this sense, DuPaul et al. (2013) recommend the use of direct and focused interventions that employ strategic thinking in order to alleviate their learning difficulties. Different intervention strategies that especially target students with MLD have been developed. Swanson (1999) reviewed 20 years of research on intervention in students with MLD and concluded that the two teaching practices with the best results were direct instruction and cognitive strategy use, particularly those practices involving self-regulation and self-monitoring. These results were confirmed in a meta-analysis by Kroesbergen and Van Luit (2003), who reported that the most successful intervention strategies used to teach problem solving to primary school students with MLD were those involving self-instruction and self-regulation, whereas direct instruction was the most effective for teaching highly specific mathematical skills. In addition, Xin and Jitendra (1999) found that explicit strategy training and external representational techniques (especially those procedures emphasizing semantic structure understanding or knowledge-mediated schema diagrams) were effective approaches for facilitating mathematics word-problem solving.

Hence, it is important that mathematics competencies be taught and learned from the very first schooling years, as it must be emphasized that children with less informal knowledge in mathematics are at a clear disadvantage relative to their peers (Jordan et al. 2010) and show poorer mathematics competence and more difficulties in word-problem solving.

One intervention example is the computer-based intervention Number Race (for children with developmental dyscalculia), which enhances the ability to compare numbers and thereby strengthens important mental links between numbers and dimensions (Wilson et al. 2006). Rescue Calcularis is also a computer-based intervention for children with mathematical learning disabilities. It aims to improve the construction and access to the mental lineal order of numbers (Kucian et al. 2011). Elfe and Mathis is yet another computer-based training program (Lenhard, Lenhard, Schug, and Kowalski 2011), which has been adapted to the German school curriculum. Alternatively, integrated dynamic representation (IDR; González-Castro et al. 2014) is a computer-based intervention that is aimed at enhancing not only mathematics competencies but also mathematically based word-problem-solving abilities.

INTEGRATED DYNAMIC REPRESENTATION (IDR)

IDR is a computerized strategy for early learning of basic mathematical competencies. According to Álvarez et al. (2007), IDR is the result of a combination of the models of external (diagrams or drawings), internal, and situated representation. This strategy is the key element of heuristic processes, the result of the combination of external and internal representations. It is structured around the following three components: fragmented comprehension, fragmented representation, and integration of the representations. It is not a part-whole schema, but rather a dynamic sequence of fragmentation, representation, and integration.

The strategy is addressed to students between 3 and 8 years old. Taking into account that knowledge is constructed by means of a discontinuous flow of textual and audiovisual information (Nicoleta 2011), by dealing with the three types of representation (iconic, combined, and symbolic), IDR can be implemented from early childhood education, even before mastering lexical processing. Moreover, as the strategy can be applied in computer language, its benefits can be observed not only at the level of mathematical knowledge but also in students' attitudes toward the subject (Delen and Bulut 2011; Walker et al. 2012).

The computerized application of IDR is adapted to early ages and aims at stimulating the processes related to mathematical competencies for problem solving in students with MLD and Attention deficit and hyperactivity disorder (ADHD) following the recommendations of Ise and Schulte-Körne (2013). These authors suggested that an intervention is most efficacious when (1) single training is used (when working with IDR, every student works individually on the computer), (2) it is adapted to individual performance levels (the IDR application contains 9 main and 27 secondary levels adapted to an individual's performance), (3) it is structured and hierarchically built (the levels in IDR are sequenced by level of difficulty and by taking into account the development of math competencies from informal to formal), (4) it includes basic non-curricular as well as curricular numerical topics (IDR involves both non-curricular topics such as representations and curricular topics such as addition and subtraction), (5) it provides ample practice (the exercises in IDR are repetitive, providing a lot of practice and promote automaticity in learning), and (6) it promotes motivation by providing rewards and reducing anxiety (the IDR provides immediate feedback and guidance during the learning process; thus, it reduces anxiety and frustration using the step-by-step learning process).

The IDR strategy has been shown to increase mathematical efficacy in 35 students without learning disabilities (González-Castro et al. 2014), in 105 students with MLD and ADHD (González-Castro et al. forthcoming), and in 288 students who were divided according to their levels of mathematics competence (Cueli et al. 2016). González-Castro et al. (2014) evaluated the efficacy of the IDR tool for the stimulation of basic mathematical competencies (informal and formal), as well as its application to solving specific problems in typical elementary school students (aged 6-8 years). All 35 students completed the TEMA-3 before and after the intervention with IDR (applied by the teacher-tutor over the course of four months in 45 fifty-minute sessions). Results pointed to the presence of significant improvements due to IDR (compared to "business as usual" instruction) on global measures of informal and formal competencies, with the exception of number facts and formal calculation. González-Castro et al. (forthcoming) analyzed the benefits of IDR in students with ADHD, MLD, and both ADHD and MLD. Results showed that students who were learning mathematics using the IDR package showed substantial improvements in all informal and formal competencies. Furthermore, the students who showed the most benefits were those who had presented MLD only. This result was attributed to the features of the program, which are presented in more detail in the following paragraphs.

Finally, Cueli et al. (2016) analyzed the efficacy of IDR in students with low, medium, and high levels of mathematics competencies. The results showed that the students who received the intervention improved significantly in comparison to the students who followed the traditional methodology. Students with a low level of competencies improved substantially more than students with medium and/or high baseline competency levels.

Description of the Program

IDR (Álvarez et al. 2007; González-Castro et al. 2014) is aimed at enhancing strategies that aid the development of the skills required for constructing external representations (e.g., diagrams, graphs, and drawings on paper) and internal representations (e.g., mental imaging of a word-problem graph or structure). The delivery of the intervention always involves the following four levels of representation:

1. At the first level, the *representation of concepts* (selection of the relevant information once presented in the problem statement), the key concepts are presented in circles (see Figure 1a, upper panel: "sheep") and the number of elements within a concept are framed in squares (e.g., "1 and 10 sheep," respectively), with the verbs that link the concepts shown in pictograms (e.g., "tengo" ["I have" in English]).
2. At the second level, the *representation of the links* (iconic-symbolic combination, or *"images linked with written words"*), the key concepts are identified (i.e., "the sheep"). They are represented in union-intersection sets, and the number of elements is specified by numerical data (see Figure 1a, lower panel: "1 sheep" in this case).
3. At the third level, the *representation of questions* (integration of the representations), the representations are connected with each other based on the type of relation posited by the operation, with the "union" pictogram defining "addition," and the "intersection" pictogram defining "subtraction" (see Figure 1b, upper panel: "union" example).
4. At the fourth level, the *reversibility of the process* (generalization to other contexts), the student is asked to reformulate the problem statement without access to the *representation of concepts* (see Figure 1b, lower panel), but instead on the basis of the *integrated representation* that leads to the final solution. This strategy favors reversibility, and therefore it is related to the generalization of learning.

Upper panel (Step 1)

Representation of concepts (selection of the relevant information) in which the key concepts are presented and associated with drawings, the numerical data that accompany them are framed in squares, and the verbs are replaced with pictograms.

Lower panel (Step 2)

Representation of the links (iconic-symbolic combination) in which, after the key concepts are identified, they are represented in union-intersection sets, whose number of elements is specified by numerical data.

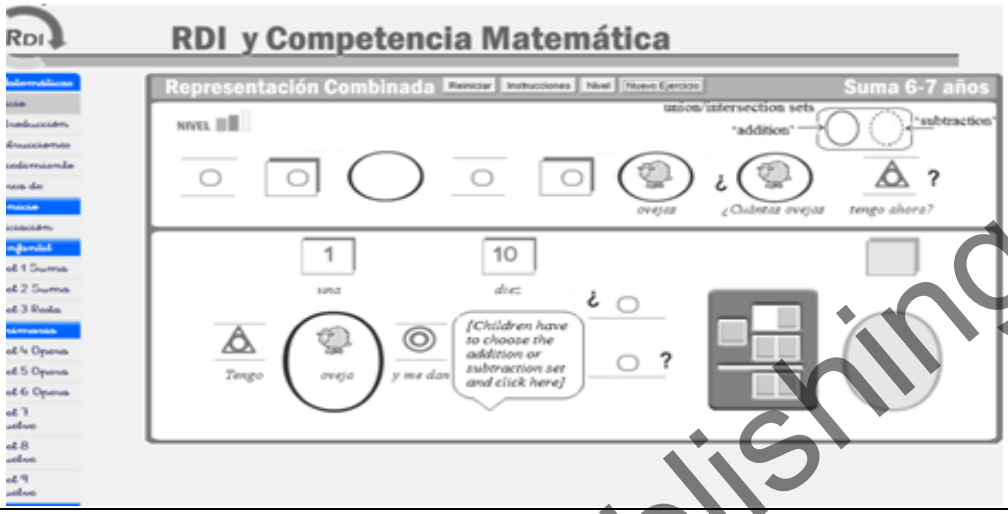

Figure 1a. Description of intervention program for the acquisition of mathematics competencies and word-problem-solving skills; Steps 1 (upper panel) and 2 (lower panel).

Upper panel (Step 3)

Representation of the questions (integration of the representations). At this level, the representations are connected to each other, depending on the types of relationships of the links to the statement: union (addition) or intersection (subtraction). When the problem is solved the student has a situated model.

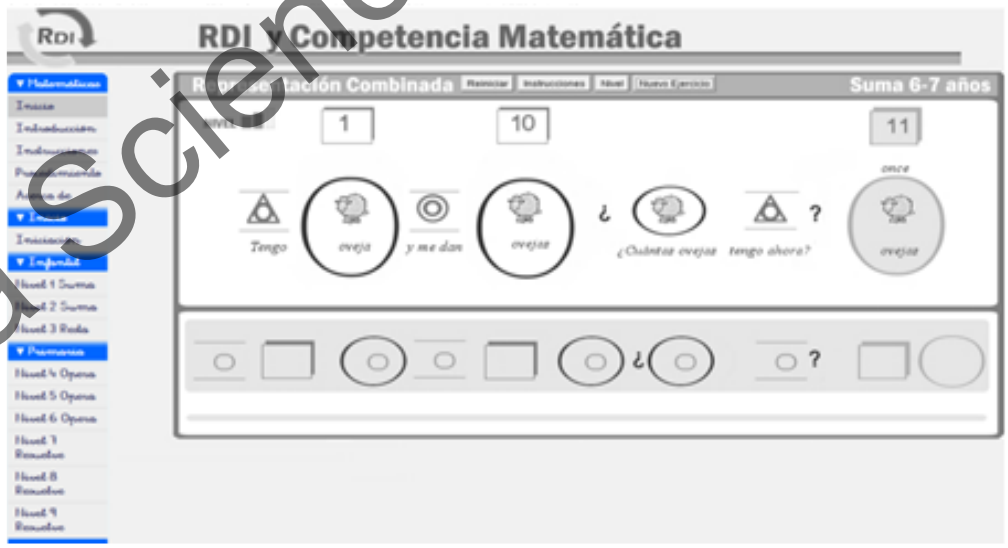

Figure 1b. (Continued)

Lower panel (Step 4)

Reversibility of the process (generalization to other contexts), where the subject is asked to reformulate the problem statement without taking the initial statement into account, on the basis of the integrated representation that leads to the final solution.

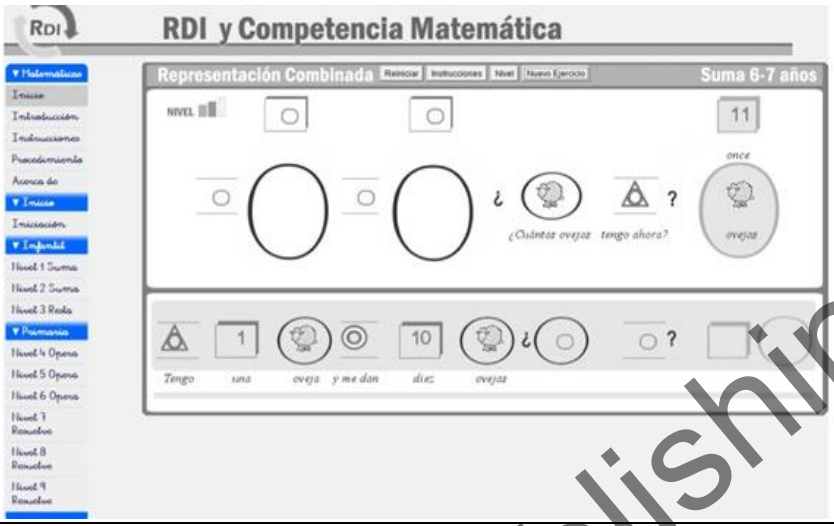

Figure 1b. Description of intervention program for the acquisition of mathematics competencies and word-problem-solving skills; Steps 3 (upper panel) and 4 (lower panel).

Once the reversibility step is completed, the student has finished the activity. The program gives students immediate feedback once they have solved the word problem; this component of the tool supports affective-motivational development because it is an immediate and contingent reinforcement (Cameron et al. 2005).

This multilevel process is carried out with the IDR computer program, which follows a logical sequence when applying competence skills that correspond to the educational level of the student. The computer program offers an "introduction" in which the steps and rules are described.

The program includes nine main levels in which the activities are sequenced as a function of the degree of difficulty, and the various competencies (operations, numbers, types of presentation) are gradually introduced. Every level has three secondary sublevels (yellow, orange, and red in the computer program) in which the sequenced activities are presented, making a total of nine main levels and 27 secondary sublevels. The following concepts are progressively introduced in sequence: *numbers* (worked on at different intervals: 1-3, 0-5, 0-9, 0-19, 0-39, etc.), *numerical operations* (addition and subtraction), *external representations* (situated models in which the data are structured), *mechanical operations* (additions without regrouping a number; additions involving regrouping a number; subtraction *without* regrouping; and lastly problems that combine additions and subtractions), and *resolutions* (as a function of the type of question).

Additionally, activities present information in three ways: iconic presentation (levels 1 to 3; images at the first three levels), combined presentation (levels 4 to 6; concepts associated with images/words at the second three levels), and symbolic presentation (levels 7 to 9; the

statements are presented exclusively in linear text at the highest three levels). Managing the program is straightforward, as difficulty levels are adjusted by age and educational level.

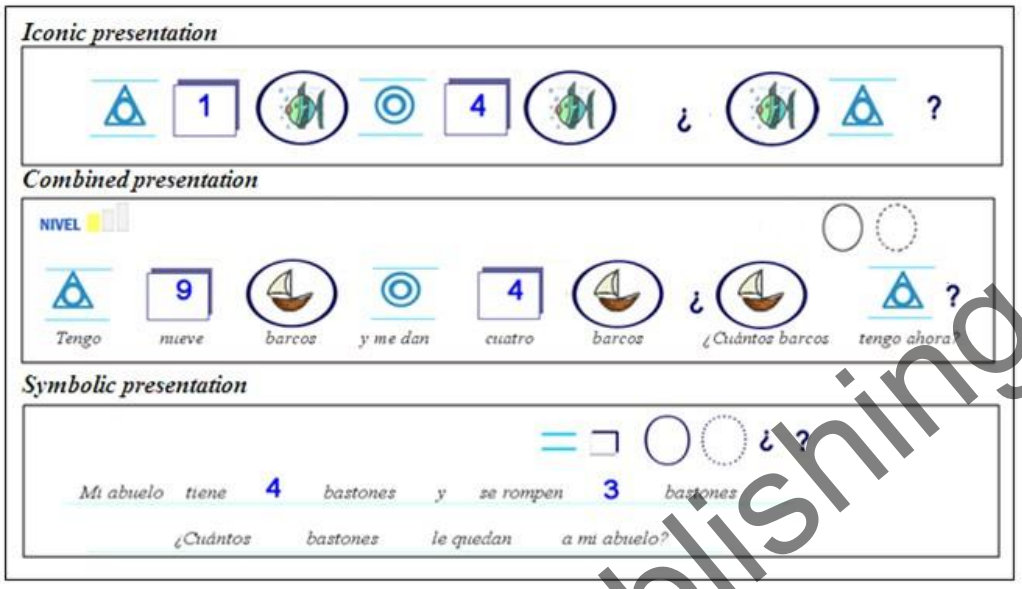

Figure 2. Example of the three types of presentation of the information (iconic, combined, and symbolic).

In the iconic and combined presentations, students begin by dragging the icons and progressively working on writing their responses in the symbolic presentation. At the symbolic level, the students symbolically interpret the data of the problem and the corresponding concepts until they reach the final solution. An example of the three types of presentation is provided in Figure 2. New statements and questions are also included in this symbolic presentation. Thus, students work on problems with different subjects and verbs, as well as new questions that determine relationships between subjects of addition, subtraction, or comparison. This is important because often students have difficulty resolving a problem because they have difficulty detecting the relationships between its parts. In this sense, word arithmetic problems have been categorized based on the semantic relationships among the quantities involved (Moutsios-Rentzos and Stamatis 2015). Carpenter, Hiebert, and Moser (1981) noted that the quantities involved in one-step word problems may form "inclusion relationships" or not. Greeno identified three categories of one-step addition and subtraction problems: "change, combine and compare" (Riley, Greeno, and Heller 1983). This scheme was adopted for the intervention program and is included in the symbolic presentation in which the three categories are worked. A "change" problem refers to dynamic situations within which a transformation is applied to the initial quantity to reach the final solution (e.g., I have 3 apples and they give me 2 apples. How many apples do I have now?); a "compare" problem describes the comparison of one quantity with another (e.g., John has 3 apples and Mary has 1 apple. How many more apples does John have than Mary?); a "combine" problem refers to a static relationship between two quantities that are combined in a set (e.g., Mary has 3 apples and John has 5 apples. How many apples do John and Mary have together?).

With this learning structure, both informal and formal competencies are acquired. Informal competencies include *counting* (considering that the number rises and falls as one increases or decreases the number of items), *quantity comparison* (the representation of a number of objects in each of the pins with a number), *informal calculation* (solving the problem without performing the specific operation, but dragging the objects to the final solution), and *informal concepts* (the child drags the number of objects represented in the numerical data). Formal competencies include *conventionalisms* (encoding and decoding of numbers and the symbolic nature of a number when written), *number facts* (mental calculation), *formal calculations* (performing mechanical operations), and *formal concepts* (symbolic concept of a number, in which one symbol can represent the total number of items).

An example of the intervention steps is shown in Figures 1a and 1b. In order to teach the concept, the student first has to read the problem at the top of the page. The next step involves the teaching of the symbols related with the learning steps of the calculations.

Target Demographic

The sample to be targeted by the intervention program consists of students from 3 years old. This level was selected because difficulties in mathematics are present as early as kindergarten, when students have already been exposed to a large base of informal knowledge in mathematics. Also, students with fewer informal knowledge skills, such as students with MLD, are at a great disadvantage relative to their peers (Jordan et al. 2010) and exhibit large deficits and greater difficulties with word-problem solving.

According to Gil and Vicent (2009), the first school years are essential for stimulating mathematical development, because this is when informal competencies can become formal knowledge and skills that facilitate acquisition of subsequent mathematical competencies.

For implementing the strategy in students who are 3 years old, the three types of presentation of information were used: iconic presentation (only images for students who neither read nor write), combined presentation (images joined to the text for students who are starting to read and write), and symbolic presentation (only text for students who can read and write).

Classroom Application

IDR is available to teachers, families, and students, on a web site in which the information presented herein will show the specific instructions necessary to work with this too.

The application can be run from the student's own computer (at home or at school), the teacher's computer, or the interactive whiteboard. This means that the application can be used in the classroom in multiple ways. Further, all students and the teacher can access the application simultaneously.

The intervention is usually carried out by means of 45 fifty-minute sessions. The most adequate protocol of intervention is based on three steps: (1) show the program and instructions to the students, (2) illustrate the four representation levels (representation of concepts, representation of the questions, representation of the links, reversibility of the process), and (3) supervise the children's performance on the computer.

CONCLUSION

This chapter pointed to present the description of the IDR strategy aimed at improving basic mathematical competencies (such as counting, quantity comparison, number facts, and informal concepts) together with word-problem solving. The hierarchy of skills and competencies is expected to make the children's learning of mathematics concepts more efficient and more adaptive, while also causing minimal inconvenience to teachers and students.

Finally, we would like to highlight that IDR is a supplementary (or complementary) intervention that, when linked to teachers' instruction and other learning activities, will allow students to reach their full potential in mathematics competencies. Given the results showing the low numeracy skills of students, it is certainly necessary to incorporate tools, strategies, and activities aimed at reducing such difficulties. As we suggest, these strategies have to be incorporated into concrete strategies that are based upon the informal competencies, which will allow the development of the formal competencies and thereby the potential to achieve adequate proficiency in essential mathematics skills.

DIRECTIONS FOR FUTURE RESEARCH

In the future it will be interesting to continue assessing the benefits of the strategy, taking into account the processes that the students carry out during the intervention with IDR. For this purpose it would be interesting to use for example *think aloud* protocols, in which students describe every thought that they have and task that they do (García et al. 2015). Also, the social validation aspects of working in computer-orientated environments need to be elucidated in the future.

With regard to accessing the IDR strategy, it is available to teachers, families, and students on a web site that also provides the specific instructions necessary to administer this novel intervention tool. Concerning future developments in utilizing this intervention tool, it would be very interesting to keep a record of every "click" of the students and how long they took to carry out the exercises. In addition, it would be intriguing to see the potential benefits of promoting this information not only to researchers, but also to teachers, students, and families. Finally, to further enhance the use of this intervention, our work is currently focused upon the compatibility of the IDR with a wide range of IT devices.

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Chapter 11

VARIABLES AFFECTING ACADEMIC PERFORMANCE, ACHIEVEMENT, AND PERSISTENCE OF ROMA STUDENTS

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ABSTRACT

The present chapter explores the current social and educational reality of the Roma population, an ethnic minority that has historically experienced, and still experiences, high levels of poverty, marginalization, and discrimination in society[1]. The present analysis focuses on their relationship with the school as an institution in order to explain what factors are the causes of their elevated academic failure and dropout rates. As such, several programs are detailed in order to provide examples of good practices that have been successfully carried out recently in different countries of Europe and have greatly improved both the access to education and the academic performance of Roma youngsters. This research has led to the conclusion that a number of actions must be taken including; fostering educational models focused on awareness and respect for diversity, addressing the poor performance and achievement from a multilevel approach with the entire society's support, and encouraging a constructive dialogue between all

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[1]Throughout the chapter, *Roma* will be employed as the most used and accepted term —according to international official documentation and several investigations— in order to refer those groups —Gypsies, Sinti, Traveller, Roma, Ashkali, Manouches, Boyash, etc.— sharing a common historical trajectory of alienation, prosecution, and exclusion, and having different cultural characteristics from those of a traditionally sedentary population. Nevertheless, it is important to note that this term is still somewhat controversial due to the great diversity of these groups and the absence of agreement on the self-identification preferences of the community itself.

socioeducational agents and the Roma community in order for them to gain more relevance in their own learning processes.

Keywords: Roma students, school dropout, academic achievement, intervention program, social inclusion, qualitative analysis

INTRODUCTION

Two decades have already passed since teacher and pedagogue José Eugenio Abajo, a member of the Association of Educators with Gypsy/Roma in Spain, suggested the need to recognize the collective social responsibility for the low school enrollment and high level of school failure among Roma children. Abajo (1996) called for a profound transformation at both the structural and ideological level of society in order to ensure greater access to a quality education for Roma children, and thereby allow them to achieve both a full personal and social development as well as to exercise their rights as full citizens. At that time, the social inclusion of the Roma population had not become a priority issue for national and supranational entities yet; however, a public debate was slowly arising as a consequence of NGO lobbying and the publication of official reports revealing worrying statistics regarding illiteracy and violence, among other issues (Miskovic 2009; O'Nions 2010: Vermeersch 2012).

In this context, two decades later, it is worth considering whether the social and educational conditions of the Roma people have undergone the anticipated advances or if the same models of discrimination, exclusion, and poverty of the past are still being repeated. Collectively, these elements constitute the central core of this chapter.

The first part describes both the social and educational reality of the Roma community and their relationship with school, with the aim of identifying the factors that could help explain the high rates of academic failure and school dropout among the Roma students. To that end, data published in different international official reports and the main contributions of the scientific community on this issue have also been considered. In addition, the findings from two qualitative studies carried out in a northern region of Spain have also been used in order to further delve into this issue. The second part identifies the variables that enhance academic performance and achievement, by showing several programs and examples of good practices that have recently been applied throughout Europe, and helped to improve the access to education, increase the rates of permanence in the formal educational system, and optimize the academic results of Roma children.

THE SOCIAL AND EDUCATIONAL REALITY OF ROMA COMMUNITY

Situation of the Roma Population's Evolution: From Persecution to Inclusion

The traveling —diaspora— of the Roma community began in the ninth century, from their exile from Punjab —India— and continued until the time of their arrival to Europe during the fourteenth century according to Miskovic (2009). Over the centuries, they suffered

constant persecutions seeking their physical and cultural elimination, various forms of racism and exclusion, in addition to a number of other Human Rights violations. However, this continual persecution did not prevent the Roma community from surviving and perpetuating the intergenerational transmission of its culture (Abajo 1996; Friedmann 2015; Miskovic 2009; Salinas 2009; UNICEF 2009).

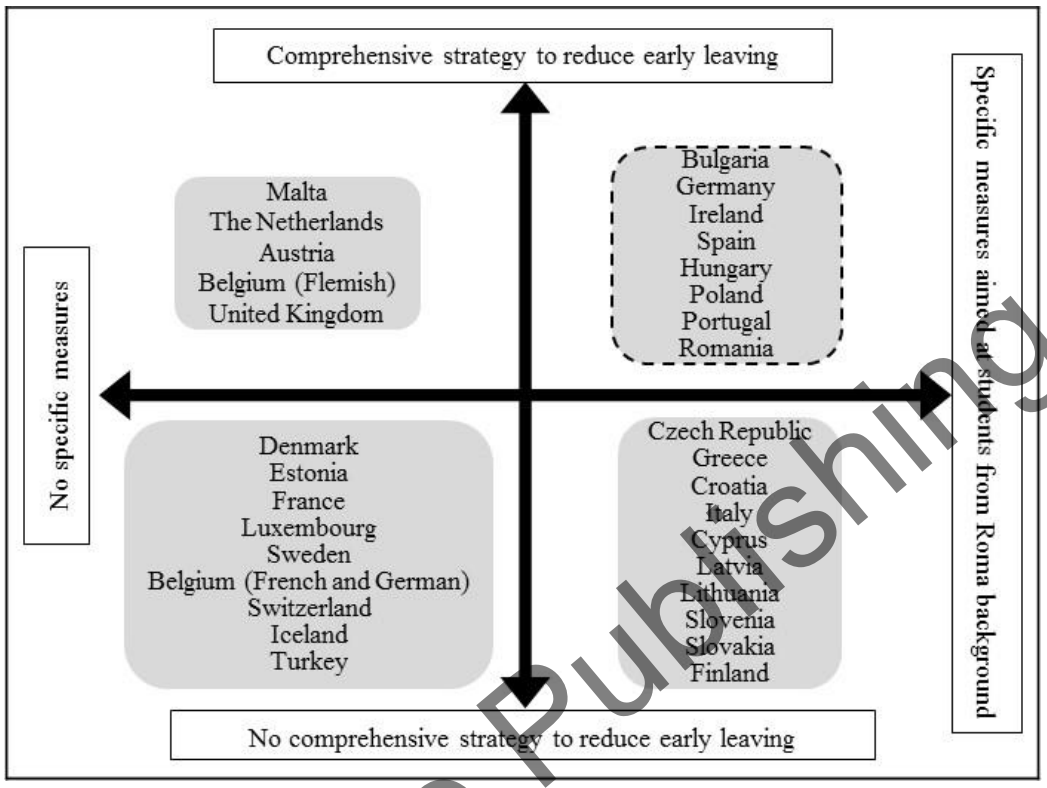
During the final decades of the twentieth century, however, the anti-gypsy discourse began to reverse, and the social inclusion of the Roma population became a priority for a number of national and European governments (Friedman 2015; Vermeersch 2012). Nevertheless, despite efforts made by the highest European Union bodies and instititutions, such as the European Commission (2014, 2016), the Roma community still suffers from significantly higher rates of academic failure and dropout than the rest of the population. This, in turn, means their social inclusion presents a particular challenge for the societies in which they live (Álvarez, González and San Fabián 2010; Romani Association of Women Drom Kotar Mestipen 2013; Decade of Roma Inclusion Secretariat Foundation 2015; European Commission 2014, 2016; Miskovic 2009; Open Society Institute 2009; UNICEF 2009), especially in the context of economic recession, which often compels the Roma population to maintain, and sometimes even revert back into, older and largely negative cultural and employment patterns (Bereményi and Carrasco 2015).

In an effort to address both the academic failure and high dropout rates among the Roma community, in addition to other high risk groups —such as students belonging to other minority groups, people from immigrant families or from a socially disadvantaged background as well as the rest of population—, the European Commission (2014) has suggested a variety of different prevention, intervention, and compensation measures. Moreover, it has recommended that all such measures must be applied within the framework of a comprehensive overall strategy; meaning that they must be carried out in a balanced way, at all educational levels, and include the involvement of the agents of all the policy areas — and not only in education. However, only a small group of countries —Bulgaria, Germany, Ireland, Spain, Hungary, Poland, Portugal, and Romania— have implemented this kind of comprehensive strategy, and provided specific measures for Roma students in particular (Figure 1).

Among the actions carried out by the supranational organizations of the European Union in order to encourage the inclusion of the Roma population, the following should be highlighted (Romani Association of Women Drom Kotar Mestipen 2013; European Commission 2016; UNICEF 2009):

- Implementation of the Lisbon Strategy 2000 (currently a Europe 2020 strategy).
- Development of legal, political, and financial instruments including: the issuance of regulations, recommendations and conclusions to be the framework of reference for the member states in order to fight against racism and anti-gypsism, as well as the implementation of effective integration policies, such as the awareness campaign "For Roma with Roma," a series handbooks and guides to prevent segregation and racism, and support for the recognition of the Roma Genocide Remembrance Day, among others.
- Support for the creation of a cooperative and transnational professional network that integrates international, national, and local institutions and platforms —Network of

National Roma Contact Points, Roma Taskforce, The European Platform for Roma Inclusion, in addition to cooperation networks between NGOs and governments, etc.



Source: Own elaboration from European Commission (2014).

Figure 1. List of countries —either belonging or related to the EU— that have implemented strategies and measures to reduce school dropout.

With regard to policies designed for the inclusion of Roma population, the Vademecum of ten basic principles that European Commission (2010) has recommended is particularly noteworthy:

1) Design policies that are pragmatic and constructive, based on reliable studies of the Roma people's real situation, and ensuring a respect for human rights, personal dignity, and non-discrimination, as European Union Member States.
2) Consider the Roma community as the main target group, but not exclude other vulnerable or economically disadvantaged groups.
3) Encourage an intercultural approach, that involves other ethnic minorities, in addition to the Roma people, in order to combat stereotypes and preconceptions, enhance the mutual understanding, and develop the intercultural competence of all citizens.
4) Implement policies aimed at the integration of the Roma community into all areas of society, and preventing segregation or indirect discrimination as a side effect.
5) Become aware not only of the greater vulnerability of Roma women in general, but also of their potential as agents of change in order to reach the goal of inclusion.

6) Encourage the diffusion and replication of successful experiences and good practices as well as the transmission of policies based on up to date, reliable and valid data.
7) Endeavor to benefit from the financial, legal, and coordination instruments of the European Union.
8) Boost cooperation with local and regional governments, so they are aware of the EU instruments and can be involved in all stages of inclusion policy development.
9) Encourage cooperation between all agents, organizations, and bodies of the civil society, to boost the research and dissemination of knowledge in order to launch a public debate.
10) Involve the whole community in the process, encouraging a constructive and respectful dialogue, in order to share their voices and experiences.

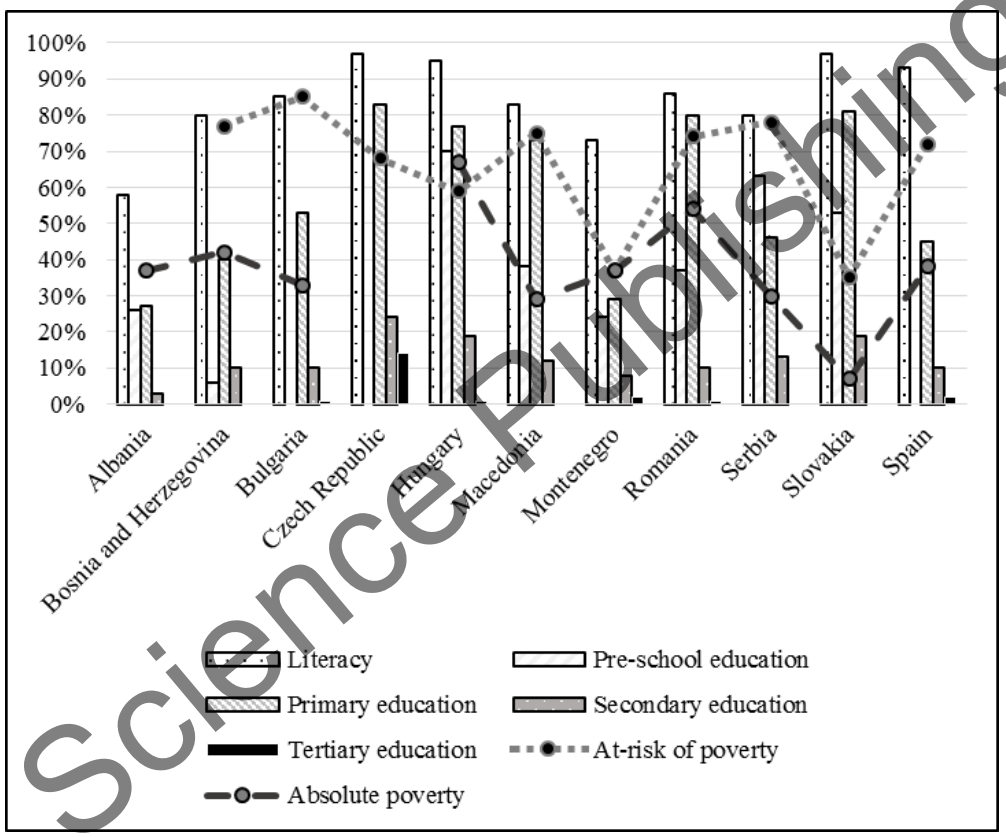


Figure 2. Social and educational situation of Roma people in 2014 in eleven out of the twelve countries taking part in the Decade of Roma Inclusion 2005-2015 (no comparable data was found for Croatia in the official report). Source: Own elaboration from data drawn from the Decade of Roma Inclusion Secretariat Foundation (2015).

One of the most encouraging initiatives in order to enhance the inclusion of the Roma population at all levels was the Decade of Roma Inclusion 2005-2015 (Decade of Roma Inclusion Secretariat Foundation 2015; European Commission 2015). Its objective was to eliminate the vicious circle of poverty and social exclusion in which the Roma population has been consistently trapped, through improvements in their living conditions —health, housing, education, and employment— as well as fighting against discrimination. This initiative

obtained commitments from the governments of twelve separate European countries —Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Macedonia, Montenegro, Romania, Serbia, Slovakia, and Spain— in addition to several NGOs. However, the results did not fully meet the expectations, partly as a result of the lofty nature of the objectives and the fact that the problems required a deeper and more engaged approach (Decade of Roma Inclusion Secretariat Foundation 2015; European Commission 2015).

Therefore, the Roma community —concentrated especially in Bulgaria, Czech Republic, Hungary, Romania, and Slovakia— still finds itself in a precarious social and educational situation, generally characterized by high poverty rates and low educational achievement levels (Figure 2). There are, however, notable differences between a number of countries. For example, the Czech Republic —along with Slovakia— is the country with the highest literacy and school enrollment rates at almost every educational stage (note: there is no data available for preschool). In addition, the Roma population in Slovakia has a better overall economic situation. Meanwhile, Albania, Bosnia and Herzegovina, and Bulgaria are the countries where the social and educational developments of the Roma group are progressing at a slower pace.

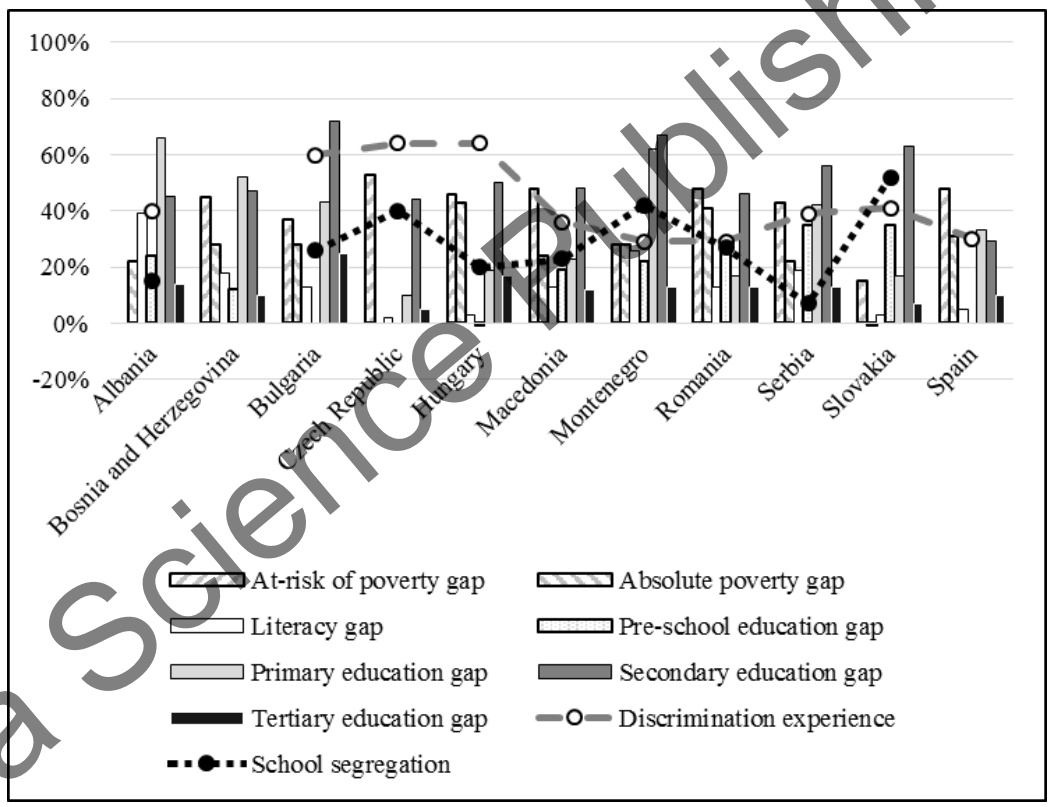


Figure 3. Reflects the incidences of school discrimination and segregation suffered by the Roma community, and the gap compared to the general population in terms of indicators related to poverty and literacy, and attendance at the different educational stages in 2014 in eleven of the countries taking part of the Decade of Roma Inclusion 2005-2015. Source: Own elaboration from data drawn from the Decade of Roma Inclusion Secretariat Foundation (2015).

According to a number of different reports (Decade of Roma Inclusion Secretariat Foundation 2015; European Commission 2016), the rates reflected above are not only worrying, but also seem to suggest that there is a "gap" that represents a significant discrepancy between the living conditions of the Roma community and the rest of population in all of the areas —in terms of housing, health, employment, and education—, as evidenced by different indicators, some which are presented in Figure 3.

The gap between the poverty and education levels (Figure 3) is still very high —generally between 20-60% in most cases, and reaching a maximum of around 70% in certain cases—, and their educational situation is particularly dire in many countries in Eastern Europe. Furthermore, within this region —especially in Serbia, Czech Republic, and Slovakia— there is a more disproportionate number of Roma students in special schools compared to the rest of population (Decade of Roma Inclusion Secretariat Foundation 2015), which is an indicator of a high incidence of Roma student allocation within the category of disabled students.

Finally, it should be highlighted that the Roma community still suffer significantly higher rates of social discrimination, particularly in Bulgaria, Czech Republic, and Hungary (Figure 3).

Upon comparing the data obtained both before and after the beginning of the proposals established during the so-called Decade of Inclusion, it was observed that differences between Roma and the rest of population had barely reduced as a result of the implemented actions. In fact, this gap has even widened in some aspects, such as the scarce presence in tertiary education, segregated school attendance, enrollment in special schools, the general situation of poverty and risk of poverty (Decade of Roma Inclusion Secretariat Foundation 2015).

In 2016, the European Commission, despite having detected some positive trends —such as increasing support for preschool education, greater use of the European Social Fund and the importance of the role played by the National Roma Contact Points— ultimately urged the member states to focus on the following strategic guidelines:

- Ensure the compliance of the legislation against xenophobia and racism;
- Suppress segregation in both housing and education;
- Ensure that the Roma population benefits from the specific measures implemented, especially in terms of health and employment services;
- Improve the system of data collection, monitoring, and reporting;
- Use the available funding in order to implement initiatives that have been scientifically proven to make an improvement to the social and educational situation of the Roma population;
- Ensure the commitment and involvement of all of those involved in policy development, via National Roma Platforms and with a particular emphasis on local governments, civil society, and the private sector.

The Roma Community and School: A History of Dissention

One of the keys to both improving the precarious situation of the Roma population and enhancing their social inclusion is to ensure that youngsters have access to quality education and the opportunity to improve their level of education. This, in turn, would also increase

their employment and social promotion chances as a result (Romani Association of Women Drom Kotar Mestipen 2013; European Commission 2016; Open Society Institute 2009; UNICEF 2009). Therefore, it is necessary to delve into a study of the factors affecting the academic achievement opportunities available to Roma students.

According to literature (see Abajo 1996; Kendall and Kinder 2007), one negative determining factor is the recurring reproduction of a social and education model built on negative stereotypes and preconceptions —including those of incompetence, lack of interest, conflictive nature, etc.— of Roma children and their academic achievement possibilities, mainly stemming from a long historical background of segregated educational practices (Abajo 1996; Miskovic 2009; O'Nions 2010; Salinas 2009). This antiquated vision led to the establishment of linear and deterministic models which simply assumed that school failure amongst Roma children was largely unavoidable. Abajo (1996) classified these models into six separate approaches: 1) *The Culturalist Perspective*, which suggests that there is a complex and problematic compatibility between the Roma culture and school culture; 2) *Sociological Determinism*, which maintains that the Roma population is trapped in a vicious and unavoidable circle in which their precarious living conditions and their lack of healthy habits lead to school failure; 3) The *Restricted Code Theory*, which suggests that the source of the problem lies in the lack of familiarity with the formal linguistic code spoken at school, which is very different from the restricted, common, and scarcely abstract code spoken by their ethnic group; 4) The *Psychologized Blame*, which holds that their lack of academic achievement is due to the different or underdeveloped skills and motivations of Roma children in general; 5) The *Ethnic and Family Blame*, which perceives the Roma identity to be a barrier to correct parenting practices or educational assessment; and 6) *Institutional Incapacity*, which blames educational institutions for the lack of proper educational methods that are adapted to the characteristics of Roma students.

These negative conceptualizations have had two major effects. On the one hand, low academic expectations among Roma students generally still persist, and are often shared by their teachers, families, and the educational community as a whole. On the other hand, the Roma minority continues to react in an all too familiar way: families maintain a certain distance with the school, which perpetuates a sporadic and tense relationship and serves to significantly widen the gap between the school and family cultures and result in a low appreciation for education among Roma families (Abajo 1996).

Nevertheless, over the last few years there has been a positive trend in the evolution of Roma family attitudes towards the need and benefits of literacy and numeracy, which is increasingly being perceived as necessary in order to be prepared for life in today's society (Abajo 1996; Bhopal 2004, 2011; Kiprianos, Daskalaki and Stamelos 2012; Levinson 2007; Macura-Milovanovic, Munda and Pecek, 2013; Rosário, et al. 2014; Salinas 2009).

However, according to Álvarez, Parra and Gamella (2016), the rates of academic failure still increase after primary school due to both a lack of family support for studying —there is still a trend of encouraging children to dropout, especially among girls—, and a lack of motivation and educational guidance for students. In addition, there are some other related factors such as the limited response capacity offered by the mechanisms of the educational system in order to address problems rooted in school segregation and the curricular gap of Roma students. Furthermore, personal factors —such as behavioral problems—, social factors—importance attached to social support networks—, cultural factors—early marriage—, and others related to the school context —side effects of the programs for

attention to diversity and compensatory education— which also seem to be influencing the lack of academic achievement at higher educational levels (Álvarez et al. 2016).

Another negative stereotype that has been identified is a fear common among Roma parents that school may not be a safe place for their children, particularly for their daughters. This results in a propensity to overprotect their values and cultural patterns due to a fear of the possibility of loss of a sense of Roma identity, which among other aspects includes a distrust for the permissiveness of non-Roma culture. (Abajo 1996; Bhopal 2004, 2011; Derrington 2007; Kiprianos et al. 2012; Levinson 2007; Lloyd and McCluskey 2008; Rosário et al. 2014). Such fears and insecurities are closely related to cultural perceptions that are radically different to the rest of the population, and often hinder attendance, involvement, commitment, and persistence among young Roma students in the school context. Specifically, these conceptions tend to focus on the vital stages —within their priority scale, education has a low practical value—, childhood and learning —preparation for adult life, and duties and greater autonomy given to girls at an earlier age—, gender —boys get more support than girls to continue studying, although ultimately boys are usually encouraged to join the professional world and girls to become housewives—, and sexuality —an overprotection girls which is closely related to elopement and virginity.

This opposition between school and family cultures often causes cultural dissonance that may eventually lead to psychological distress in Roma students (Bhopal 2011; Derrington 2007; Kiprianos et al. 2012; Lambrev 2015; Levinson 2007; Lloyd and McCluskey 2008), which often forces them have to choose to preserve their Roma culture and identity or continue their studies. As a result of this disjunction, the fear of Roma identity loss is so high that they usually drop out of school even when the students have already developed high academic expectations (Levinson 2015).

In addition to the negative influence of that fear, another element hindering greater school persistence among Roma students is the reception of contradictory social messages. On the one hand, they are encouraged to reach a high educational level in order to have a better professional and social future, whilst the cost of such education is often perceived as too high when compared to real employment opportunities (Kiprianos et al. 2012; Kosko 2012; Lloyd and McCluskey 2008). On the other hand, they are often forced to attend schools that still have high segregation levels —as previously stated— where the teachers often have low expectations for Roma students' achievement possibilities. Those contradictory expectations generally baffle them and hinder their ability to learn, which leads them —especially if they have low self-esteem and history of bad experiences— to inadaptation —absenteeism and low performance—, academic failure and, ultimately, to drop out of school. This, in turn, confirms the aforementioned fears, low expectations and preconceptions, thus further continuing the cycles of dissention and exclusion (Abajo 1996).

Nevertheless, in order to delve into the study of low performance and academic achievement within the Roma population, international research developed while working with different ethnic minorities must first be taken into account. In this regard, there are particularly enlightening studies that have been carried out in the United States. In particular, the Cultural-Ecological theory —CE—, developed by Nigerian-American anthropologist John Ogbu between 1974 and 2003, which focused on explaining the roots of the problem of low performance and academic achievement of certain minority groups —African Americans, Native Americans, and Mexican-Americans— when compared to the successful results attained by other ethnic minorities —such as Chinese, Japanese, and Arab students— and the

majority society (Ogbu, cited in Abajo and Carrasco 2011; Brüggemann 2014; Harry et al. 2008). As Abajo and Carrasco have stressed (2011), this theory goes beyond the more limited approaches of the theories focused solely on addressing the deficiencies and offers a new multi-level approach that combines the wide interweaving of factors which affect the complex school problems of these minorities. The Cultural-Ecological theory —CE—highlights three main factors: the presence of a historic hostile and controversial relationship between the majority and the minority; the persistence of structural inequality hindering the improvement of Roma social and economical status; and the beliefs, perceptions, and strategies facing this social and academic past and present situation. According to this theory, low performance can be understood as an adaptive response when reaching a higher educational level does not create any appreciable opportunity for greater chances of social promotion, and when it is also interpreted as a betrayal or a move away from their ethnic group —known as *apayamiento* or loss of Roma culture in the case of Spanish Roma people. Upon encountering these arguments during his research, Brüggemann (2014) discovered a possible alternative viewpoint: the Roma college students that he interviewed were able to reinterpret their newly obtained culture as a dynamic element instead of a loss of culture, which challenges the notion that education is necessarily a form of alienation.

A number of other international studies (Harry et al. 2008; Miskovic 2009) have identified certain similarities between the situation African American and Latin American minorities in the United States and the lack of academic achievement and school persistence in the within the Roma community. The most noteworthy of these similarities include that: belonging to environments of sociocultural deprivation hinders the acquisition of necessary competences for academic achievement; attendance at segregated schools provides a lower quality education and fewer learning opportunities; there is often a high level dissention between school and family culture —language, culture, expectations—; a lack of motivated and qualified teachers, as well as a generalized persistence on the part of teachers to focus only on actions to reduce their perceived deficiencies. Furthermore, this consistently negative vision that teachers have often leads to an erroneous identification of Roma students as disabled —due to their cultural or linguistic difficulties— leading them to be enrolled in special schools. According to Harry et al. (2008), this means that minority students are a social segment that is particularly vulnerable to being socially and academically excluded at school, as a direct result of the dominant linguistic code and cultural prevalence. These authors also argue that teachers have the belief that cultural assimilation is a requirement for academic achievement among minority students, and suggest that teachers should be taught how to provide proper responses to the specific needs created by student diversity —both linguistic and cultural—, in order to avoid resorting to older intervention models that focus instead on the perceived deficiencies of these students. Therefore, borrowing from theoretical proposals from the United States, Lambrev (2015) suggests including content related to their culture in the curriculum and educational programs, instead of simply perpetuating an antiquated monocultural and hegemonic approach.

Given the important role played by professionals who are directly involved with Roma students in order to improve their academic performance and achievement, it is essential to listen to their voice as well. Therefore, a qualitative and interactive study in northern Spain was conducted, in which key informants, experts with a wide variety of experience working with both Roma families and students in a number of institutions, were interviewed (Hombrados and García 2006; McMillan and Schumacher 2005), with the specific aim of

providing relevant information about the needs and elements affecting their academic achievement levels.

This chapter is focused on the Spanish context due to the interest in the subject, the proximity of the key informants, the abundance of examples of avoidable practices, and high incidence of school non-attendance or attendance to segregated schools and classes. Since the approval of the Spanish Constitution in 1978 and subsequent subsidiary regulatory legislation, there has been a major focus on the total inclusion of the Roma students in the classroom, and achieving an inclusive educational system has become the generally accepted ideal (Salinas 2009).

As a consequence of the aforementioned bad practices, however, people continue to have a largely misinformed and generally negative views of the Roma population and their low rates of academic achievement. Currently, despite the significant progress achieved in the first two decades of the 21st century in terms of school enrollment and educational standardization of Roma students, the goal of total educational inclusion has not yet been achieved. Moreover, the incidence of high rates of absenteeism, academic failure, dropout from compulsory education, poor access to higher education, discrimination and racism, and prevalence of a monocultural curriculum continue to persist, leading to the fact that this part of society still continues to be largely overlooked (De Haro 2009; Salinas 2009).

The current state of the situation makes selection of the Spanish case a natural starting point to delve into the study of the reality of Roma community at large. Research for the present study was carried out in two separate stages. Four participants, all of whom were experts directly and professionally related to Roma population in formal education contexts, were interviewed in the first stage, which was carried out in 2013 (Antúnez and Pérez 2014): the Headmaster of a school with more than two decades of experience working with *çigano* students —Roma people whose ancestors migrated to Asturias from Portuguese region of Trás-Os-Montes e Alto Douro—; a social educator from the City Hall to which the school belongs, who has worked with them for more than a decade; a school counselor; and a teacher and community service expert, who acted as the mediation manager between the school, Roma families and the community. Subsequently, two key informants from the Gypsy Secretariat Foundation of Asturias (known in Spanish as FSG) participated in the second stage, carried out in 2015: a school counselor and a Roma mediator who worked for several years with Roma students participating in the educational programs of the foundation.

Previously, an analysis of the school context and a comprehensive documentary and bibliographic review on Roma population living in Asturias had already been developed (Álvarez et al. 2010; Ayuntamiento de Ribera de Arriba (Asturias) 2011; Fernandes 2011).

Thereafter, the study focused on the design of semi-structured in-depth interviews in order to collect information regarding the assessment of the current needs, in conjunction with an interview scheme provided by Hombrados and García (2006) as a reference. The final interview model included questions related to different dimensions such as the personal and professional characteristics of the key informants, and the needs identified for *çiganas*/Roma people, the motivations of the professionals working with the Roma community and the most helpful personal characteristics, as well as any relevant experiences that would allow for a better understanding of working with this ethnic group.

After conducting the interviews, they were transcribed in order to carry out a later content analysis by standard procedures and stages —categorization, codification, and synthesis— according to thematic criteria, supported by a provisional system of categories that was

modified after subsequent revisions and discussions by all of the researchers involved (Kvale 2011; Rodríguez, Gil and García 1996). Finally, a frequency analysis was carried out and the data was graphically represented.

The results of the first stage of the investigation showed that *çigano* origin students attending preschool and primary school and their families —a marginal settlement— had to face several exclusion factors: work and economic related problems —unemployment, job insecurity, dependence on social aids, and underqualified profiles—; low education levels, both in adults and young Roma children and a tendency to enroll all Roma children in the public municipal school; personal skill deficiencies —low social skills and low autonomy to manage their daily lives—; social problems —lack of intercultural relationships and social rejection by other groups—; hygiene and sanitary problems —inappropriate patterns of nutrition, and high risk for disease—; deterioration of their residence —overcrowding, unhealthiness and accessibility difficulties—, among others.

Likewise, the analysis of the school context showed that 70% of students are *çiganos*, and their families have a low sociocultural level and are at risk of social exclusion. Furthermore, in spite of the educational guidance and counseling they received, these students are at higher risk of school dropout starting at the end of the second year grade of compulsory primary school education, and those students who want to continue studying must enroll in a high school located far from their neighbourhood, which further hinders the completion of the compulsory education and persistence in post-compulsory education. Moreover, it is noteworthy that the school did not implement any specific program aimed at encouraging Roma student persistence in the educational system, nor were any other actions taken with the aim of preventing school dropout.

Finally, after categorization and codification of the 215 units of analysis derived from the interviews, four categories emerged: "Relationship between Roma-*çigana* population with school and academic learning" (37.21%); "Response of the different services and/or socio-educational workers to the needs that these group implies" (34.42%); "Group traits," including strengths and weaknesses (18.6%); and "Suggestion of solution to their needs" (9.77%).

In order to address the analysis of the factors affecting academic failure/achievement of the *çigana* population and the potential comparison of the results attained with the data obtained from the analysis of second-stage interviews, only 120 quotes were taken into consideration for this chapter, both of which matched the two categories of particular interest: "Relationship between Roma-*çigana* population with school and academic learning" and "Group traits," representing 66.67% and 33.33% respectively (Figure 4). This figure shows that the relationship between the school and the Roma families has a greater influence than the group traits, and the difficult relationship between these two factors does not facilitate the emergence of academic achievement opportunities, mainly due to the family's ideological barriers —including an underappreciation of the value of learning and low academic expectations. Also, it should be highlighted that a lack of personal skills and - habits, their dependence on social aids, and their socio-economic priorities were among the most influential traits of the group.

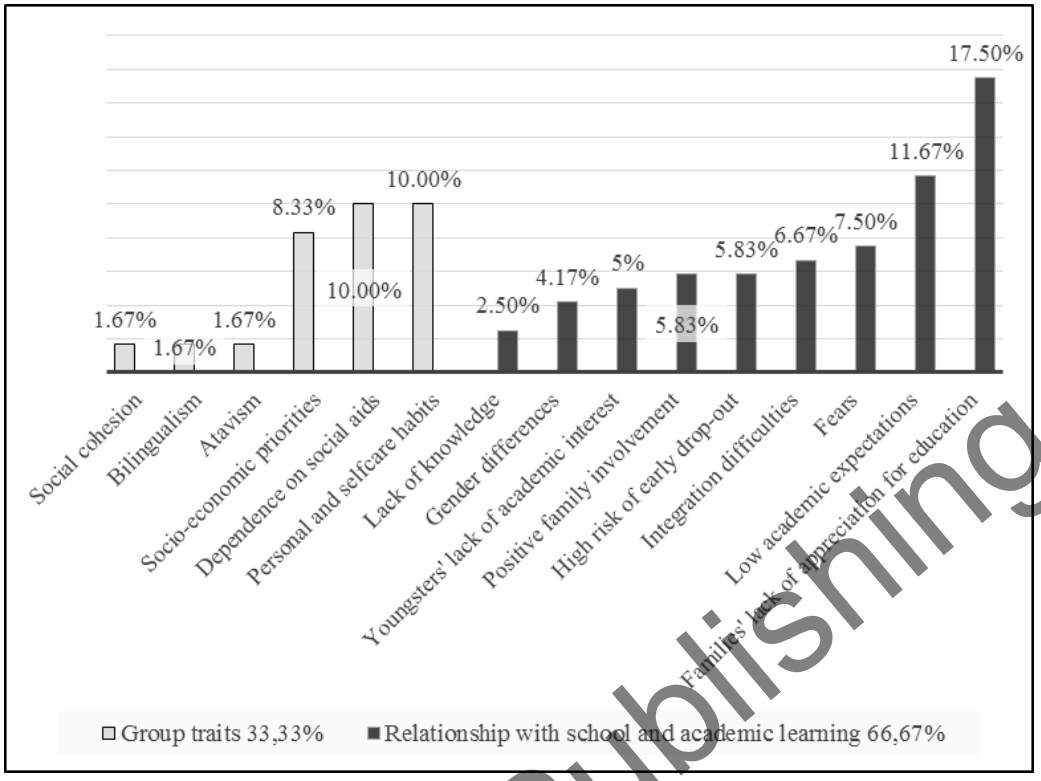


Figure 4. Elements affecting the school performance and persistence of Roma population according to the interviews of key informants in 2013. Source: own elaboration.

During the second stage, 162 quotes were taken into consideration in the content analysis of the interviews, and three categories emerged: "Elements affecting the school performance and persistence of Roma population" (62.96%), "Characteristics of the staff of educational programmes of FSG" (25.31%), and "Key informants suggestions" (11.73%). Within the most significant category, there are a variety of personal, family, school, and community elements that are identified which either encourage or limit the academic achievement among Roma students (Figure 5).

Factors with greater burden are related to the community context (53.92%), especially the positive evolution of family views regarding school aspects, networking and involvement of socio-educational agents, and the presence of Roma references who have continued studying themselves. Also, personal variables (23.53%) emerged such as the curricular gap, and family variables (18.63%), such as positive relationship with the families. Lastly, school factors (3.92%) were found to have a very low level of relevance.

On the basis of the results obtained, the qualitative study demonstrates that there is an agreement between this study and data obtained from the aforementioned research regarding everyday practices related to certain factors affecting school failure and achievement, particularly those concerning the disadvantaged situation of the Roma people in general — and especially *çiganos*— which include: a lack of sociopersonal skills and habits, lower social and economic status, discrimination, dependence on social aids, and low family education level.

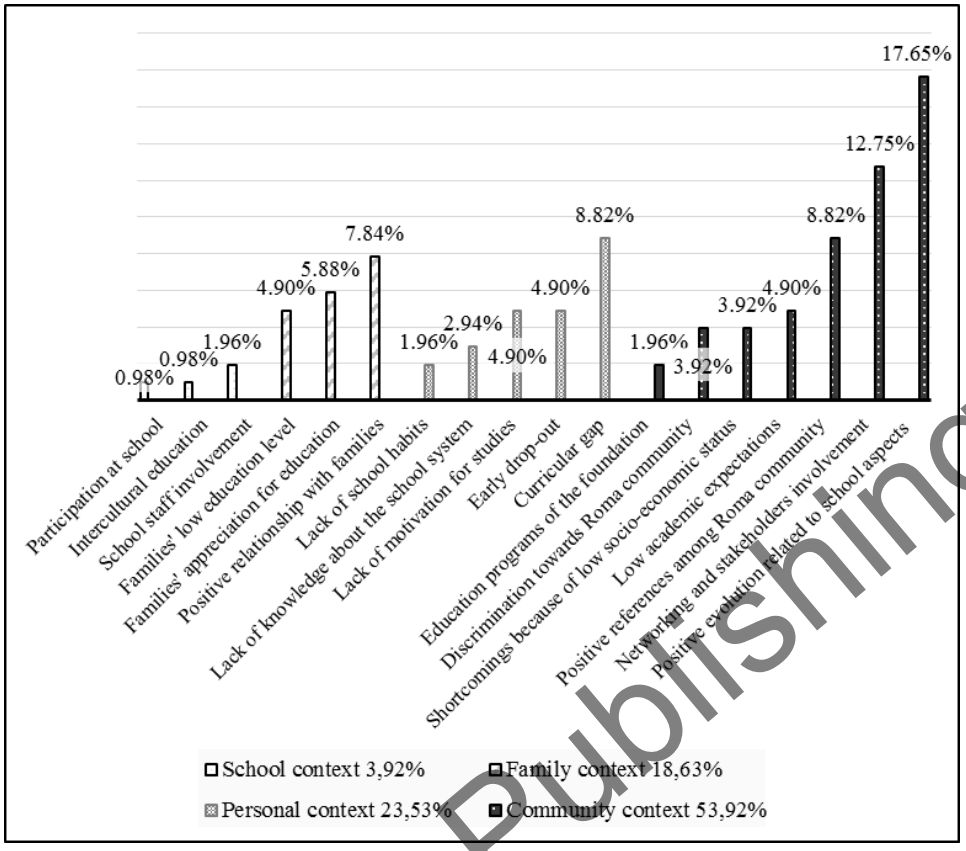


Figure 5. Elements affecting the school performance and persistence of Roma population according to the interviews of key informants in 2015. Source: own elaboration based on data from Antúnez and Pérez (2014).

On the other hand, there is a remarkable contrast between the interviews conducted with the FSG key informants and those working in educational institutions and Councils; the FSG key informants tend to have a more positive point of view regarding to Roma family evolution in terms of school aspects, and also think that community factors have greater specific influence on school failure or achievement —evolution of school aspects, networking and socio-educational involvement, and positive references. This suggests that that those elements should be taken into consideration in order to implement successful future intervention methods.

Nevertheless, it is surprising that factors related to the school context are scarcely mentioned when the literature generally highlights problems in the school and family relationship, as indicated by the key informants in the 2013 study.

Finally, although there are discrepancies between the families' appreciation for education —this could imply that there is an appreciation but that it is limited to the most basic levels of learning and excludes higher studies— it does seem to indicate that overall academic expectations seem to remain quite low.

Lastly, it should be remembered that the results reflected here correspond to the perspectives of the key informants, and not the Roma families and children themselves; the participation of Roma population in interviews and focus groups should also be considered

for future research. Moreover, as it was carried out during an intership, there were time and sampling features that limited this study that should also be mentioned. Therefore, this chapter suggests the need for the development of broader and deeper future studies engaging universities, NGOs, schools, and the Roma community.

KEYS TO ENHANCING ACADEMIC PERFORMANCE, ACHIEVEMENT, AND PERSISTENCE OPPORTUNITIES AMONG ROMA STUDENTS

Currently, the social organization of society is being subjected to profound changes stemming from a variety of IT and globalization related factors. As a result, society is increasingly becoming based on networking and cultural discourses, which often makes the management of an individual's personal identity become a social exclusion or inclusion factor (Úcar 2004). The inclusion of the Roma population in social networks could potentially help foster a transition from educational and social models that consider their Roma identity to be a social and educational disadvantage to their academic progress towards a more inclusive intervention model, and lead to a more positive conceptualization of their ethnic identity in the future.

The School, an Intercultural and Inclusive Learning Context

Schools, as the main socializing agents along with the family, should implement steps to foster inclusion so that all students —regardless of their personal, family, and socio-cultural characteristics— can benefit from an education that is adapted to their needs and encourages respect and appreciation for their individual and ethnic differences (Álvarez and Bisquerra 2012).

In this regard, the school environment should foster tolerance and respect for diversity and, eventually, provide a truly intercultural and inclusive education. A list of actions and strategies to reach this objective are presented below:

Table 1. Keys to creating a intercultural and inclusive school environment

Student	• Involvement in after-school activities. • Promotion of social and emotional development. • Development of intercultural competence. • Access to up-to-date and reliable data on diversity.
Schools	• Development of a comprehensive approach and collaborative work, based on the self-evaluation of the real needs of the school and community, while justifying their actions to encourage inclusion. • Support for the implementation of reinforcement and accompaniment programs — Roma association too. • Presence of different cultural and ethnic profiles among the students. • Training of teachers on intercultural issues.

Table 1. (Continued)

Schools	• Effective leadership of Administration Teams for promoting tolerance. • Ethical commitment on behalf of all teaching staff with regard to diversity. • Presence of culturally and ethnically diverse staff at all school levels. • Proper Administration Team counseling on promoting a respect for diversity. • Closer and more regular collaboration with NGOs specialized in working with ethnic minorities. • Implementation of evidence-based programs in schools in order to fight intolerance. • Incorporation of diversity training into school curriculum, promoting the use of resources that contain the history and culture of the Roma community as well as other minorities. • Development of teaching methodology and activities encouraging inclusion, discussion and cooperation, e.g., peer education, collaborative learning, project-based learning, learning-services, and other active and collaborative methodologies. • Positive assessment and implementation of bilingual and multilingual education. • Efficient use of the IT resources in order to benefit from all potential learning opportunities. • Teaching of religious diversity within the framework of Human Rights. • Implementation of activities enhancing the involvement between families and schools, including figures such as a Roma mediator
Entire community	• Providing intercultural experiences and teaching respect from early stages. • Shared responsibility of socioeducational agents —schools, families and professionals within the community— regarding equality and tolerance in education. • Creation of collaboration opportunities between family, school and community —by opening schools and building learning communities. • Promotion of research providing up-to-date and sound information on conditions that create a respect for diversity. • NGO Participation in policy design intended to encourage diversity. • Government recognition of good practices implemented by schools. • Implementation of global policies encouraging equality in all areas. • Development of awareness-raising campaigns to eradicate preconceptions and stereotypes, and promotion of meeting points between minorities and majorities. • Building of networks and learning places in which teachers could share resources and experiences.

Source: Own elaboration from De Haro (2009) and Van Driel, Darmody and Kerzil (2016, 78-82).

By having made the inclusion of all students a principle objective, schools have greatly enhanced the potential for full development of all students. However, according to De Haro (2009), in order to fully realize inclusion process, it is critical to drastically depart from the traditional explanatory models of school dropout and academic failure which are based on the notion that student deficiencies and individual differences are the root of the problem, and consistently blame any lack of academic achievement on their family and immediate environment. As a result, the author suggests creating a dialogue with the Roma community so that it could become in the real active agent in its own learning process.

The following are examples of variables, programs, and good practices in order to meet the specific needs of the Roma community, improve their academic achievement and overall performance, and enable them to become active agents in the transformation of their reality.

Variables, Programs, and Good Practices Encouraging Higher Performance and Academic Achievement among Roma Students

The implementation of the Decade for Roma Inclusion 2005-2015 was the first step to achieving the goal of inclusion, and it was an unique opportunity for collaboration between different European countries, and the identification of actions and strategies that help to achieve a more equitable access to education. The Open Society Institute (2009) has made ten recommendations to this regard:

1) Carry out reliable and valid studies on the social and educational situation and school enrollment of the Roma community.
2) Implement policies and programs based on scientific evidence which ensure the quality of their inclusive education.
3) Encourage a respect for differences and reject any kind of discrimination and racism, particularly towards Roma children.
4) Implement policies aimed at encouraging an appropriate level of training for teachers, and provide resources for Roma students to progress within the school system together with the rest of their classmates.
5) Enhance the access to preschool education for Roma children, so that they can start acquiring language early on, and develop crucial patterns and habits to succeed at the following educational stages.
6) Reduce the bureaucratic and economic barriers making it difficult for most disadvantaged Roma families to enroll their children in school.
7) Boost the use of active and comprehensive teaching methodologies, teacher training, recruitment of Roma teachers, and highly qualified and committed teachers.
8) Involve Roma families and community in the school system, by establishing communication and cooperation channels in the decision-making processes.
9) Reach a greater level of commitment from all education professionals in terms of cultural and linguistic integration of Roma students.
10) Add specific contents to the school curriculum aimed at encouraging greater knowledge and respect for the cultural and ethnic diversity of the Roma community.

It is also important to mention some *personal factors* which help to encourage better academic achievement opportunities. Among others, these include the student's academic expectations and their commitment to the persistence of their studies; determination to look for conditions allowing them to reach that objective; good social and negotiating skills when dealing with their peers, family, and community pressures; the ability to self-regulate their own learning process; and high levels of self-concept and self-esteem, which should be boosted by emotional education programs (Abajo and Carrasco 2004; Regadera, Pérez-Herrero, and Burguera 2013; Rosário et al. 2014; Rosário et al. 2016). Regarding the cognitive and emotional aspect, the use of strategies for coping with psychosocial stress was

also significant in order to increase the chances of academic persistence. This stress is often produced by the cultural dissonance and social exclusion that young Roma students experience, which usually pushes them towards disengagement and school dropout. Derrington (2007) found that students who used cognitive restructuring strategies, counted on support networks, and had reached a bicultural identity tended to continue studying longer. However, the students who were at higher risk of school dropout were those who had implemented maladaptive coping strategies, such as physical and verbal retaliation, defiance of authority, non-compliance with penalties, absenteeism as form of escape, and concealment or denial of their Roma background. In contrast, Abajo and Carrasco (2004) identified both the ethnic invisibility —hiding the Roma identity from their classmates and teachers in order to avoid discrimination and exclusion— and the *apayamiento*, or the equivalent to the "acting white" strategy from Ogbu's study (Brüggemann 2014) —both of which are considered improper behavior by real Roma members— as ineffective strategies for creating academic achievement opportunities.

The *boost of relational and affective changes* has also been cited as another factor in improving the educational situation of Roma students. Abajo (1996) identified the promotion of strong social and affective links; the eradication of contradictory and racist messages and statements full of low expectations from their own community and the rest of the society. In this regard, Abajo and Carrasco (2004) stress the importance of considering positive elements such as teacher assessment, support, and commitment, a positive and integrated school environment, relationship with qualified Roma peers, the support and appreciation of families[2], the access to economic and educational resources, and the promotion of school achievement by Roma associations.

Likewise, it is necessary to consider the *factors related to the school*, and concretely those policies and practices developed within the school. Among those variables identified in the specialized literature, the following are noteworthy: 1) the incorporation of a practical approach with positive references to Roma community in school curriculum; 2) teacher training on interculturality/multiculturalism; 3) recruitment of Roma staff in order to broaden visibility of positive references; 4) elimination of segregated practices towards the Roma population; 5) family involvement in educational institutions; 6) eradication of policies hindering school access to Roma children; 7) prevention of bullying; 8) recognition of their ethnic status; 9) support for learning; 10) recognition of staff responsibility in terms of Roma values; 11) provision of educational support to overcome the cultural differences and encourage a school and family partnership; 12) ensuring a commitment from the Roma population to schooling in general, school access, and persistence for Roma children (Bhopal 2004; Bhopal and Myers 2009).

Regarding the Roma family commitment to schooling, some authors (Flecha and Soler 2013; Luque and Lalueza 2013; Ryder, Rostas and Taba 2014) have stressed the importance of *encouraging the empowerment of the Roma community*, either through participation in communities of practice —such as the Shere Rom House— or through the transformation of schools themselves into learning communities —such as the Spanish school La Paz from the INCLUD-ED Project. One of the positive consequences resulting from a greater involvement on the part of the Roma people —particularly in the learning communities— was the increase

[2]Families with social capital, understood as good educational level of their parents and high expectations regarding the education of their children.

in the number of Roma children who identify with school and have an appreciation for the importance of academic results and a feeling of belonging. This factor, together with the positive awareness of Roma parents, correlates directly with setting goals and academic expectations, and increases the likelihood that young Roma students will continue their studies (Macura-Milovanovic et al. 2013).

The identification of examples of good practices has also been cited as an element which positively affects academic achievement among Roma students. Therefore, some outstanding European programs in terms of quality and potential for replication in different contexts are listed below.

Table 2. Description of programs and good practices implemented across Europe

Source	Location	Program/Good practice	Some keys to success
O'Nions (2010)	EU Member States	SOCRATES-Comenius programme (1995-1999) The education of Roma Children in Europe project (2002)	●Intercultural approach —teaching methods, Roma culture in school curriculum and resources. ●Recruitment of Roma mediators/agents.
UNICEF (2009)	Bulgaria	Desegregation Project (since 2000)	Implemented in schools in remote areas: ●School transportation. ●Additional academic support.
Messing (2008)	Hungary	After-school programme Learnery project (2006)	●Roma community management supported by a school. ●Empathetic teacher training. ●Creative teaching methods. ●Activities aimed at promoting integration and acceptance of ethnic identity.
UNICEF (2009)		National Educational Integration Network	●Extra funding for schools. ●Advice and technical support of the National Educational Integration Network —for the benefit of needs, teaching methods, and additional academic support.
	Romania	PHARE program Access to Education for Disadvantaged Groups (2001)	Implemented at various educational stages, with the participation of NGOs and governmental entities. ●Recruitment of Roma mediators at school. ●Provision of school meals. ●Renovation of teaching methods. ●Offering the subject of Roma history. ●Teaching Romani language.
UNICEF (2009)	Serbia	The Equal Chances Project (2002-2005)	Three lines of action taken at all educational stages (5-18 years): ●Influence on educational policies. ●School changes. ●Closer collaboration with the Roma community through use of Roma assistant teachers. Parent involvement and non-Roma teacher awareness increased, attendance rates in preschool and primary school improved. Acknowledged as an example (Van Driel et al. 2016).

Table 2. (Continued)

Source	Location	Program/Good practice	Some keys to success
		Development and Educational Centres (Prokuplje)	●Comprehensive and cross-sectional approach: educational services and programs —transition to primary and compensatory programs until age 16—, focused on children as well as families, health, access to employment and social aids, etc. ●Individualized teaching methods focused on cultural aspects.
	Slovakia	Roma Education Initiative (2003-2005)	Implemented from preschool to vocational training in Jarovnice-Karice Roma settlement. ●Activities for families and children aimed at encouraging the transition to primary school and prevent from segregation —e.g., parenting, literacy or health programs. ●Individualized teaching methods. ●Recruitment of Roma assistant teachers and previously-trained mothers. Adapted to three other locations and acknowledged as an example (Van Driel et al. 2016).
	Macedonia	Alliance for Inclusion of Roma in Education	●Scholarships for students. ●Academic support through counseling.
		Roma Education Centers (Part of the Roma Education Program)	●Activities aimed at developing psychosocial and academic skills of preschool and primary school students. ●Teaching methods focused on the children. Enhanced the transition from preschool to primary school, and encouraged greater parent involvement.
Georgiadis, Nikolajevic and Van Driel (2011)	Greece, Austria, Cyprus, Romania, Slovakia, United Kingdom, the Netherlands, and Italy	Project INSETRom (since 2007)	Intercultural program for teacher training in a collaborative context: ●Adaptation of teaching methodologies and perceptions to the current multicultural society. ●Improvement of educational, intercultural, and psychosocial skills. Improved self-confidence levels, but strategies aimed at addressing certain frequent school aspects —attendance and attitude in class, attention span, school preparation, socialization, overcoming stereotypes, etc.— were ultimately considered insufficient.
Rosário et al. (2016)	Portugal	Yellow trials and tribulations intervention program	●Increased inter-institutional cooperation between university and the non-governmental Red Cross Youth organization. ●Volunteers and researchers presented the program to the Roma community, obtaining the consent of the leaders.

Source	Location	Program/Good practice	Some keys to success
Luque and Lalueza (2013)	Spain	Shere Rom House	Community of practice held after school, local adaptation of the model of Quinta Dimensión (Fifth Dimension) —promoted by a University network. ●Collaborative participation of child-college student pairing/partnership. ●Virtual-game environment. ●Creation of a shared ideoculture. Improved the positive bonds between Roma community and higher education, group feeling of belonging, cultural recognition, and the acquisition of necessary skills achievement —including formal language, adherence to rules, use of IT material…
Flecha and Soler (2013)	Spain	Project INCLUD-ED (2006-2011)	●Activities in which children, teachers, and families shared their model of school and their preferences regarding learning. ●Agreement for dialogical inclusion of the entire educational community in order to implement successful actions. Identified Successful Educational Action —actions leading to an improvement of social cohesion and academic achievement. The Spanish school La Paz was one of the participants.

Source: Own elaboration from different international publications.

Among the aforementioned proposals, there are three particularly noteworthy initiatives which proved to encourage the Roma community empowerment and lead to marked improvements in the academic achievement and persistence rates among Roma students. Firstly, the iniciative carried out by Rosário et al. (2016), which promoted inter-institutional cooperation between university and a non-governmental organization. On the one hand, a group of university researchers designed and developed the Yellow trials and tribulations intervention program. On the other hand, the non-governmental Red Cross Youth organization helped by providing space and volunteers. Both volunteers and researchers had previously presented the program to the Roma community, obtaining the consent of the leaders. The program was applied to a group of 17 Roma primary school students, residents of Braga (Portugal), and a control group of 18 subjects. The intervention focused on (i) making children aware of their active role in the learning process and (ii) providing them with self-regulation skills (planning, implementation and evaluation). The ultimate goal was to improve their academic performance and their chances of school success. At the core of the intervention is the hypothesis that the involvement and motivation of the Roma students improves thanks to the educational value that is given to stories in the Gypsy culture. The results showed an increase in both their cognitive and behavioral engagement (attendance, participation and sense of belonging to the school).

Secondly, the importance of the role played by the research team and Roma association involved in the *Shere Rom House* project cannot be understated. Their joint work helped design a new institutional framework that was finally able to overcome the former segregated and assimilationist educational practices which had focused mainly on individual deficiencies. These two socioeducational agents acted as agents of change and positive

partners in the dialogue —which is all to often limited and hostile— between Roma families and the school.

Thirdly, the implementation of *Project INCLUD-ED* signaled a great step forward due to its success in the transformation of schools into learning communities by creating a dialogue between all community members —families, children, researchers, policy makers, amongst others. The development of this inclusive community has not only given the Roma population a real leading role in their own learning process, but also provided a highly effective means to combat disintegration while simultaneously encouraging interculturality/multiculturism and inclusive education, along with policies committed to creating greater social justice and the establishment of both political and community links (Ryder et al. 2014).

Using the foundations established by the *Project INCLUD-ED*, the Romani Association of Women Drom Kotar Mestipen (2013) coordinated the Rom Up! project with funding from the European Commission between April 2012 and March 2013. It included eight associations from Bulgaria, Greece, Spain, Romania, Ireland, and Belgium, and its objective was to create an International Roma Network in order to make an active collaboration between participating associations, socioeducational agents, and the Roma community possible, in order to identify and diffuse examples of Successful Educational Actions —or SEAs. To reach that goal, a team mainly made up of both Roma scholars and non-scholars — known as the Qualitative Evaluation Group — analyzed the successful educational experiences which had acknowledged the Roma community discourse and showed scientifically demonstrable enhancement to the process of social inclusion and academic achievement among Roma primary and secondary school students. From the eleven total educational experiences selected by the research team, six SEAs were highlighted (Romani Association of Women Drom Kotar Mestipen 2013, 46-55):

1) Roma relatives and members of the community are involved in decision-making processes, hence improving the coordination between families and schools, and enhancing the integration between minority family culture and the school majority culture.
2) Roma culture is integrated into the school, either by incorporating it as optional subject within the school curriculum or promoting the intercultural training of teachers and encouraging family involvement in school activities.
3) Schools recruit Roma references, Roma volunteer alumni, Roma teachers or other Roma professionals, thus proving that it is possible to both maintain their identity and succeed at studying.
4) Classrooms are organized from an inclusive perspective, in heterogeneous and comprehensive groups working collaborative and dialogical methodologies; this helps to reduce problems with social cohesion and coexistence, improve school performance and attendance, boost respect for diversity and eradicate stereotypes, and encourage learning, motivation, self-confidence, and proper behavior among Roma students.
5) Roma relatives and members of the community take part in educational activities, either as students or as teaching figures.
6) Schools create dialogue and discussion meeting points for Roma students through Student Councils or Roma Student Meetings, which increase their role in their own learning process and school life.

Upon review of these factors, programs, and strategies affecting Roma academic failure and achievement opportunities, the importance of obtaining the support and cooperation of all agents and bodies of the civil society becomes abundantly clear. An inter-institutional cooperation of this kind would result in the creation of social and educational networks, enabling both the Roma community and the school system to build an educational project based on common objectives and ultimately lead to true social and educational inclusion (Díaz-Gibson et al. 2015).

CONCLUSION

After exploring the current social and educational reality of the Roma community, it has become evident that a number of personal, family, school, socioeconomic, and historical factors interact at a variety of levels to perpetuate the high rates of discrimination, poverty, social exclusion, academic failure, dropout, and gap between their members and the rest of the population. It is a complex issue which urgently needs to be addressed, as these low educational attainment levels greatly restrict their opportunities for future personal, employment, and social promotion.

There is a definite need to create academic achievement opportunities and increase academic persistence; however, the alienating, deterministic educational models focused on the perceived deficiencies of Roma children must be overcome in order to develop more holistic, inclusive, intercultural, and ecological models, such as Ogbu's Cultural-Ecological theory. Particularly, a careful review of official reports and specialized literature revealed that it is crucial to implement inclusive policies aimed at improving their living conditions at all levels; encouraging an early and equitable access to a formal, intercultural, and inclusive education for Roma children; promoting certain personal characteristics at cognitive and emotional level; making significant changes at a relational and affective level; and facilitating the introduction of functional and structural modifications to educational institutions in general. Moreover, improvements in education attainment levels and educational inclusion also require commitment from all of the social and education agents involved, and the creation of a school and family partnership based on a constructive dialogue that listens to their voices and experiences in order to give them a more important role in their own learning process. In this respect, it is crucial as well to be aware of that role that universities and Third Sector institutions can also play as agents of change in order to help reduce the differences between school and family contexts, which too often still hinder the academic performance of Roma students.

Finally, and despite the appropriate adaptations and cautions, it is noteworthy that both the findings on the factors causing academic failure and lower academic achievement of the Roma population as well as the aforementioned successful examples of good practices could be extrapolated for use with other ethnic minorities in similar social and educational situations —such as African-American and Hispanics in the United States. In addition, in order to ensure the successful implementation of good practices in any given environment, UNICEF (2009) has made the following recommendations:

- Encourage the joint effort and commitment of schools and governments in order to support the continuity of successful initiatives, and demonstrate this commitment with the education of Roma people by setting a consistent and solid line of action, regardless of any administrative changes that may occur.
- Before the implementation of the initiative, a comprehensive evaluation of the specific context —including both internal and external factors— must be carried out, and the necessary adaptations have to be made in order to satisfy both the needs of Roma population and the current political possibilities.
- Encourage a high integration level among all of the participants in the proposal — especially if it is integrated in inclusive policies—, at all educational stages, and involve a variety of social and educational agents.
- Enhance the role that Roma parents and the Roma community as a whole play in the evaluation of their needs and in the decision-making process, as well as encourage the development and management of their own initiatives with government support.
- Encourage the gathering of data on their progress via comprehensive reports, with a direct connection to those carrying out the projects.
- Ensure the evaluation and monitoring of progress of the program if they are being managed by governmental entities.
- Address the general discrimination level in both the institutions and the general society, which only serves to reinforce the fears of suffering from it and thereby further encourages the Roma population to conceal their Roma identity and hinders an honest evaluation of the experience's real impact.
- Ensure the implementation of programs and proposals aimed at encouraging desegregation, thereby promoting a truly inclusive educational system and avoiding a potential situation in which receiving compensation for deficiencies could become the main strategy for Roma students to reach greater levels of academic achievement.

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Chapter 12

ADOLESCENT VIOLENCE AND DRUG USE

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ABSTRACT

This chapter presents an analysis of factors influencing substance use and school violence and describes the *Programa para la Detección de Conductas Adictivas y Violencia en Educación Secundaria* [High School Violence and Addictive Behavior Detection Program]. This program was the result of a need for in-depth analysis of substance use and peer violence, two problems present in today's youth. Although these two subjects must be dealt with separately, the scientific community is beginning to consider a relationship between them, implying a combined approach to their evaluation in order to include all the factors involved. [This project was carried out with the collaboration of the Almeria Provincial Govt].

Keywords: violence, drug use, detection program, adolescents

INTRODUCTION

Adolescence is the transition to adulthood in which changes in individual and social development take place. It involves stressful events that have to be confronted effectively, and which could lead to the adolescents' involvement in situations that could seriously compromise their development (Bermúdez, Teva and Buela-Casal 2009). Thus substance use (Gázquez et al. 2015) or how they relate to their peers (Inglés et al. 2014) could lead to problematic adolescent behavior repertoires.

Recent reports on youth risk behavior have provided data alerting of a diversity of highly prevalent problems during adolescence (Calmaestra et al. 2016, 11-13), such as substance use

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and peer violence, which are present as two of the main causes of injury and mortality among young adults (World Health Organization 2014, 1-20). Both, as phenomena of great social concern, require an effective approach. Detailed analysis of the factors involved in their development and/or maintenance is therefore of interest.

Due to the relationship found between substance use and violence, with higher incidence in school contexts, research must follow new paths oriented toward preventive intervention in both problems (Pertegal, Oliva and Hernando 2010).

PEER VIOLENCE AND BULLYING IN SCHOOLS

School violence which still occurs, in spite of progress made in intervention in coexistence in schools (Gázquez et al. 2010), remains a priority target of research in several different areas and disciplines (Espelage, Rao and de la Rue 2013; Hornby 2016). Studies on the prevalence of bullying reveal the magnitude of the phenomenon among students, which is similar and generalized in most countries (Pérez-Fuentes and Gázquez 2010).

Studies on the prevalence of school violence (Carrera Fernández et al. 2013) show that there are different types of bullying, verbal abuse being the most common. An inverse relationship has also been found between the severity and prevalence of bullying. Aside from this, results of gender studies suggest that males have the most violent behavior, except in relational violence. Boys are victims of direct physical abuse much more frequently than girls, and girls are more often the butt of rumors.

As the school context offers opportunities for interaction with the peer group, study of antisocial and delinquent behavior in youth there is relevant (Gázquez Linares et al. 2011; Pérez-Fuentes et al. 2013). In fact, there is often a positive correlation between the role of aggressor at school and antisocial behavior (Cerezo and Méndez 2013).

Peer relations are now becoming part of the new theories, showing a negative relationship between social support and school violence, with clear applications to coexistence in the school (Jenkins and Demaray 2012). Along this line, Rodríguez-Fernández et al. (2016) have proposed the combination of school adjustment and subjective wellbeing as an adolescent psychosocial adjustment model in which the adolescent's psychosocial adjustment requires multifactorial treatment. This is influenced by self-concept, social support (family and friends), conflict confrontation skills, etc. (Gázquez et al. 2015).

Nevertheless, the family, as the child's first socialization context, is extremely important to their acquisition of values, and provides the experiences necessary for them to construct their identity (Páez-Blarrina et al. 2006). In adolescence, the family still exerts its influence on the configuration of their psychosocial adjustment (Gázquez-Linares et al. 2015). Although in the beginning, interest in studying values at this stage of development emerged from problematic behavior, which is more frequent among adolescents, for over a decade, this line of research has been undertaken from a more positive viewpoint (Benson et al. 2006, chap. 16). That is, it is insufficient to know only the risk or socially unacceptable behaviors to eradicate them. They must be replaced by others based on the acquisition of values that make the adolescent socially competent (Oliva et al. 2010). The importance of adolescent values resides mainly in their role in attitude and response to peer conflict (Garaigordobil 2012; Pérez-Fuentes et al. 2015), and in fact, although there is a close association between them, values have a higher weight than beliefs in decision-making (Wallace et al. 2006). Analysis of

the response of those involved in aggression is another facet of interest in designing interventions for coexistence in the school. Authors like Sulkowski et al. (2014) suggest that males have a wider response repertoire than girls, as they are more prone to trust their friends and make use of strategies such as humor to face victimization. The diversity in the victim profile in school violence (e.g., passive or submissive, aggressive or provocative) makes such questions as the perception those involved have of their schoolmates take on special relevance in the dynamics of the victimization process (Del Moral et al. 2014). Bullying has negative consequences for all those who participate in it in one way or another, most obviously those directly involved as first order agents, the aggressors and victims.

Aggressors, who are characterized by their strong physical condition, are usually very popular and leaders within their peer group (Rose and Swenson 2009). Even though aggressors have high scores on tests of self-esteem, O'Moore and Kirkham (2001) qualify this by suggesting that aggressors, like their victims, feel insecure about themselves. Thus to determine the effects of participation in bullying episodes on different domains of self-esteem, the typology and frequency of intimidation, and the ages of those involved should be taken into consideration. Some studies have shown that aggressors are socially more highly valued than their victims, while others suggest a positive relationship between aggression and higher perceived popularity, although it correlates negatively with social preference (Vaillancourt, Hymel and McDougall 2003). Aggressors' justification of their behavior is often social recognition by their peer group and leadership (Farmer et al. 2010), as well as authority and power over other members of the group (Kulig, Hall and Kalischuk 2008). Furthermore, aggressors score higher in individualism associated with intimidating and authoritarian behavior (Georgiou et al. 2013).

Victims, on the other hand, are characterized by a weak build and are very timid, leading to high anxiety and withdrawal (Polo del Río et al. 2013). Distress associated with the position of being on the receiving end of aggression deteriorates the perception of support and belonging to the peer group (Sulkowski et al. 2014). This could generate feelings of rejection toward school (Inglés et al. 2015) and have negative effects on academic performance (Álvarez et al. 2015). Depression, isolation and low self-esteem (Garaigordobil, Martínez-Valderrey and Aliri 2014), in some cases going as far as suicidal ideation (Crepeau-Hobson and Leech 2016), are some of the consequences of bullying in adolescents involved in these episodes.

In general, direct involvement in violent episodes during adolescence has prejudicial consequences to mental health (Arseneault, Bowes and Shakoor, 2010), the ability to interact with others (Undheim and Sund, 2010) and relating in adulthood (Wolke et al. 2013), as well as behavior problems (Keelan et al. 2014). It is therefore not just the victim who suffers from the adverse effects of such situations, because there is also a negative impact on aggressors, which directly influences their future behavior, and observers, who suffer from disorders and poorer psychosocial adjustment in adulthood (Rivers et al. 2009).

ADOLESCENT DRUG USE

During the last decade, forms of leisure related to alcohol and smoking, such as binge drinking, have appeared which have caused a considerable increase in the intake of alcohol among youth and also the number of hospital emergencies derived from its abuse (Gómez-

Fraguela et al. 2008). According to the last High School Student Drug Use Survey 2014/2015 (Ministry of Health, Social Services and Equality 2016), there has been a considerable improvement in habit reduction with respect to earlier surveys. Although this report collects data on a wide variety of substances, it places special attention on alcohol and smoking as the most widespread among adolescents.

One of the questions which has received the most attention from research is the motivational patterns of adolescent substance use. Comasco et al. (2010) identified the reasons for drinking as affiliation, distraction and domination. However, reasons differ depending on the type of substance and the circumstances surrounding its use. Orsi et al. (2014) found change in substance use to be associated with the effect of external factors, such as restrictions. Many of adolescents' beliefs about minimization of risks derived from using substances such as alcohol or tobacco are erroneous (Suárez et al. 2016). Thus adolescents with positive attitudes and/or expectations for alcohol (e.g., as a social facilitator) have a higher risk of starting such behavior and keeping it up (Gázquez et al. 2015).

Adolescence is characterized by premature experimentation with new sensations (Azpiazua, Esnaola and Sarasa 2015). Marcotte et al. (2012) mentioned that one of the consequences of binge drinking is the tendency to become involved in high-risk practices. Several studies have associated impulsivity and sensation-seeking with drug use (Gázquez et al. 2015; Neumann et al. 2010; Leeman et al. 2014). Malmberg et al. (2013) suggested that sensation-seeking and impulsivity are the traits with the heaviest weight in drinking and cigarette smoking during early adolescence. The first is responsible for starting and the second for its continuation. These relationships may be particularly evident during adolescence, when there are changes in development and at the same time a wider opportunity for substance use (Alcázar et al. 2015).

Impulsivity, apart from functioning as a factor predisposing to participation in violent situations, a characteristic trait of aggressors (Pichardo Martínez, Arco Tirado and Fernández-Martín 2005), is also associated with other risk behaviors, such as substance use. A study by Pérez-Fuentes et al. (2015) on the relationship between impulsivity and adolescent use of alcohol and tobacco showed that students who said they were users scored significantly higher on impulsivity.

Thus higher levels of impulsivity and sensation-seeking become more evident in early adolescence and are predictive factors of more substance use in mid-adolescence (Charles et al. 2016).

In addition to individual factors (Gázquez-Linares et al. 2015), risk and/or problematic behaviors also depend on other factors which are determinant for building up self-concept and personal wellbeing (Álvarez et al. 2015; Goñi Palacios et al. 2015), whether family (Martínez-Loredo et al. 2016) or with peer group (Monahan, Steinberg and Cauffman, 2009).

Adolescent substance use does not only favor the appearance of bullying; the two phenomena have a more complex relationship. Continuation of their long-term effects has been confirmed. There is a stronger tendency to substance use and abuse in young adults who have been aggressors during their adolescence (Moore et al. 2014). This also happens to the victims of bullying, whose likelihood of substance use increases, although it is only significant in the severest cases (Connell, Morris and Piquero 2015). The idea of an obvious relationship between substance use and problematic, maladaptive or risk behavior in adolescents may be derived from such contributions as these.

Work on preventing use of alcohol and other drugs should consider the theoretical basis of adolescent decision-making in this respect. Litt and Lewis (2016) recently applied the healthcare decision-making model of Gerrard et al. (2008) to adolescent alcohol use. In this case, it was concluded that the adolescent alcohol user's decision-making process is characterized by lack of planning and is largely socially conditioned.

One of the findings on the etiology of adolescent substance use refers precisely to the influence of social groups as determining factors, both in starting and maintaining behavior prone to use (Simons-Morton and Farthat 2010). The role of the family, in addition to social learning, severe discipline, little parental control/monitoring, poor family cohesion and frequent conflict may contribute to risk behavior in their adolescent children, including substance use and abuse (Ewing et al. 2014).

The school and community have also been found to be contexts for the confluence of environmental factors associated with substance use (Bonell et al. 2013; Fletcher, Bonell and Hargreaves 2008). In fact, there is a relationship between academic performance and substance use, in which those who fail are also the most prone to this type of behavior (Leonard et al. 2015), and there is a higher risk of use when young people do not feel "part of" their community or perceive a certain degree of insecurity in their surroudings.

SCHOOL VIOLENCE AND ADOLESCENT DRUG USE: THE NEW TECHNOLOGIES IN INTERVENTION

The students themselves think that among the various agents involved, social setting variables, such as substance use, are intimately related to school violence (Pérez-Fuentes and Gázquez 2010), demonstrating the relationship between violence and drug behaviors.

As school violence is a severe public health problem, many studies have examined the effect of school antibullying programs. Vieno, Gini and Santinello (2011) studied the prevalence of six forms of intimidation (physical, verbal, relational, sexual, cybernetic and racist) and the role of smoking and drinking in intimidation among adolescents. The authors found that all forms of intimidation were associated with drinking and smoking. A meta-analysis by Lee, Kim and Kim (2015) on the effectiveness of programs implemented in recent years concluded that for antibullying programs to be effective, they must include training in emotional regulation, orientation in peer social skills and a school intimidation policy.

Even though in recent years, programs for working on adolescent substance use have been started up, there are still few initiatives for treatment combined with school violence (EDDRA-European Monitoring Centre for Drugs and Drug Addiction 2015).

Millán Jiménez, Pérez Manzano and Zamora Arenas (2014) compared the effects of intervention based on a traditional methodology with others that included the use of the new technologies (ICTs), concluding that incorporation of the new technologies reinforces substance use reduction attitudes and increases demand for intervention to quit. Espada et al. (2015) examined the effectiveness of substance abuse prevention programs in schools, and found that although they were inefficient for prevention, they acceptably modified attitudes toward it. They also found that joint use of traditional intervention resources with audiovisual materials would make methodologies more effective.

In recent years, interventions proposed have had a wider approach based on scientific evidence supporting the relationship between violent adolescent behavior and substance use, as well as common underlying factors (Jackson et al. 2012). This perspective requires the design of intervention programs in a diversity of domains of influence (both risk and protection) on adolescent problematic behavior to be undertaken simultaneously.

HIGH SCHOOL ADDICTIVE BEHAVIOR AND VIOLENCE DETECTION PROGRAM

Background

The starting hypotheses leading to later program development were that risk of addiction and violence, and behavior preventing or protecting against addictive use and violence, can be identified. Typical profiles can also be found for subjects who show addictive behavior or violence, as well as for those who do not. Likewise, there is a direct relationship between addictive substance use (alcohol, tobacco, etc.) and the level of violence shown by the subject.

Program Goals

The program was designed to find out the prevalence of addictive substance use and violence in adolescents. Another of the goals of the resource is to analyze predictive behavior and behavior related both to substance use (alcohol, tobacco and other drugs) and peer violence. Finally, after implementation, the instrument's ability to detect risk behaviors related to substance use and violence in schools will be evaluated, as well as for intervention and improvement.

Results Prior to Program Design

Before the computer program was designed, questionnaires were administered to a sample of adolescents to analyze the variables of interest and identify those that received sufficient empirical support for their inclusion in the instrument. The sample of 822 participants was comprised of students in 3rd and 4th year of high school *Educación Secundaria Obligatoria* [Cumpulsory Secondary Education] (ESO), ranging in age from 13 to 18 years with a mean of 14.84 years (SD = .87). Of the total sample, 51.8% (N = 426) were males and 48.2% (N = 396) were females, with mean ages of 14.85 (SD = .87) and 14.82 years (SD = .86), respectively.

The instruments used in this first evaluation stage were:

1. Ad hoc questionnaire for collecting sociodemographic data on substance use (especially alcohol and tobacco), family and peer group relations, etc.

2. *Escala de Apoyo Social* [*Multidimensional Scale of Perceived Social Support*] (Chou 2000). A 23-item scale for evaluating perceived social support in adolescents in several different contexts. It includes three subscales: family, friends and significant others.
3. *Escala de Búsqueda de Sensaciones* [*Sensation-seeking scale*] (Pérez and Torrubia 1986). Based on 40 items, it measures trait risk-seeking. It is comprised of four subscales: Emotion-seeking (BEM), Excitement-seeking (BEX), Disinhibition (DES) and Susceptibility to Boredom (SAB).
4. *Escala de Impulsividad Estado* [*State Impulsivity Scale*] (EIE; Iribarren et al. 2011). It evaluates the frequency with which impulsive behavior susceptible to being modified with intervention appears. It has 20 items for three factors: Gratification (urgency to satisfy an impulse, intolerance to frustration, etc.), automatism (rigid, repeated behavior), and attentional (unplanned, unevaluated behavior).
5. *Aggression Questionnaire* (AQ; Buss and Perry 1992). Its 29 items evaluate aggression in its different forms (physical and verbal) and two emotions related to aggressive behavior (anger and hostility).
6. *Escala de Acoso Escolar Percibido* [*Perceived Bullying Scale*] (AEP; Manga et al. 2007). Eight items collect data on perception of bullying in an interpersonal setting.
7. *Peer Conflict Scale* (PCS; Marsee, Kimonis and Frick 2004). Consists of 40 items and finds out physical and relational reactive and proactive aggression.

Some of the results of the evaluation stage are presented below in each of the variables analyzed.

Substance Use

Participants in the study were asked about the frequency with which they smoked and drank alcohol. Responses to the question *How often do you smoke cigarettes?* showed that 70.2% of students had never smoked, 14.6% very few times in their life, 2.8% a few times a week, 4.4% a few times a day, 2.2% around a half a pack a day, 0.7% around a pack a day, and 0.1% of students said they smoked more than a pack a day.

Frequency of drinking alcohol (*How often do you drink alcoholic beverages?*) was found to have the following sample distribution: 33.2% of the students said they had almost never drunk alcohol, 26.8% a few times in their life, 20.3% a few times this year, 12.2% a few times this month, 7.3% a few times a week, 0.1% a few times a day, and another 0.1% several times a day.

Finally, they were asked about how they received information about the effect that drug use has on their health and other aspects of their lives. The majority response was communications media (45%), followed by family (27.5%), friends (21.9%), and in 5.6% of cases none of the above.

Coexistence in the School: Profiles and Perceived Bullying

The following profiles of involvement in episodes of school violence were found: 10.7% victims (had suffered or suffer from violence from their fellow students), 9.9% aggressors (have been violent toward their fellow students) and 71.6% observers (have seen violence toward fellow students). In the last group, 40.6% intervened in these cases compared to 59.4% who, on the contrary, did not intervene when they witnessed these episodes.

The total mean score on perceived bullying in the sample was around 11.41 (*SD* = 4.41). By gender, males had a mean of 11.18 (*SD* = 4.40) on the scale and females 11.65 (*SD* = 4.41).

Smokers had a mean score of 11.40 (*SD* = 4.49) on the perceived bullying scale, while those who had never smoked cigarettes had a mean of 11.41 (*SD* = 4.24). Those who drank or had drunk alcohol showed a mean score of 11.58 (*SD* = 4.73) on perceived bullying compared to nondrinkers who had a mean of 11.33 (*SD* = 4.27).

Family Relations

55.9% of students said that someone in their family who lives with them is a smoker. 30.5% usually argue with their parents or siblings, 9.4% have run away from home at some time.

Their parents allowed or would allow 10.2% of students to smoke and 27.7% to drink. 90% said their parents knew their friends and 79.8% of their parents also knew where they were going when they left the house. Finally, 88.1% think they are loved by their parents.

Peer Group Relations

25.4% took the initiative in group decisions compared to 59.3% who preferred to let others decide. 75.2% felt they had an important role in their group of friends compared to 13.4% who did not consider it relevant, and 7.3% said they felt detached from the group.

77.1% of the sample made friends easily, compared to 23.4% who said it was hard for them. With respect to group influence, 16.4% said they let those around them take the lead and 5.5% were negatively influenced. Specifically, 2.8% felt group pressure from friends to drink alcoholic beverages and 2.4% to smoke cigarettes.

Perceived Social Support

Mean scores were found for each of the Perceived Social Support factors (social peer support, family support and support from the partner or significant figures) for groups by substance use (tobacco and alcohol).

Cigarette smokers perceived more social support from their peer group (*M* = 24.43; *SD* = 4.52) and partner or significant others (*M* = 24.88; *SD* = 4.38) to the detriment of family (*M* = 22.85; *SD* = 5.48). The same thing happened with those who drank alcohol, perceiving more social support, not only from their peer group (*M* = 24.69; *SD* = 4.19), but also from their partner or significant others (*M* = 25.35; *SD* = 4.01) than from family (*M* = 22.17; *SD* = 5.59).

Impulsivity

The analysis of each of the factors on the State Impulsivity Scale showed that the mean scores of both users of tobacco (Gratification: *M* = 13.91, *SD* = 4.17; Automatism: *M* = 12.36, *DT* = 4.06; Attentional: *M* = 14.74, *SD* = 4.39) and alcohol (Gratification: *M* = 14.77, *DT* = 4.13; Automatism: *M* = 12.82, *DT* = 4.02; Attentional: *M* = 15.35, *DT* = 4.41), increased on all the factors on the scale, leading subjects to act even though the consequences of their behavior were negative (Gratification). There was also a tendency to repeat that behavior although no social support was received or they were punished (Automatism), and, finally, they did not pay attention to all the information they need to be able to act appropriately (Attentional).

Apart from this, the mean scores on each of the factors of the State Impulsivity Scale by coexistence profile (aggressor, victim, observer) revealed that the aggressor profile had higher scores (Gratification: *M* = 15.41, *SD* = 4.25; Automatism: *M* = 13.31, *SD* = 3.91; Attentional: *M* = 16.21, *DT* = 4.06) than the victim (Gratification: *M* = 12.83, *SD* = 3.95; Automatism: *M* = 12.20, *SD* = 3.57; Attentional: *M* = 13.80, *SD* = 3.61) or observer (Gratification: *M* = 13.49, *DT* = 4.20; Automatism: *M* = 12.13, *SD* = 4.06; Attentional: *M* = 14.36, *SD* = 4.35) profiles.

Sensation-Seeking

Mean scores on the Sensation-Seeking Scale for BEM (Seeking emotions and adventure), BEX (seeking experiences), DES (disinhibition) and SAB (susceptibility to boredom) by use, show that the mean for tobacco (BEM: *M* = 6.27, *SD* = 2.52; BEX: *M* = 5.50, *SD* = 1.76; DES: *M* = 4.96, *SD* = 2.25; SAB: *M* = 4.45, *SD* = 1.97) and alcohol users (BEM: *M* = 6.35, *SD* = 2.44; BEX: *M* = 6.08, *SD* = 1.75; DES: *M* = 5.53, *SD* = 2.28; SAB: *M* = 4.80, *SD* = 2.01) were both higher than nonusers on all the factors related to sensation-seeking.

Aggressive Behavior

Finally, scores on the Aggression Questionnaire (physical, verbal, anger and hostility) by substance use showed that both users of tobacco (Physical aggression: *M* = 2.58, *SD* = .83; verbal Aggression: *M* = 2.78, *SD* = .76; Anger: *M* = 3.04, *SD* = .82; Hostility: *M* = 2.93, *SD* = .72) and alcohol (Physical aggression: *M* = 2.77, *SD* = .80; Verbal aggression: *M* = 2.83, *SD* = .74; Anger: *M* = 3.15, *SD* = .78; Hostility: *M* = 2.96, *SD* = .71) had a higher mean than nonusers on aggression factors, whether physical, verbal, from anger or hostility.

DESCRIPTION OF THE PROGRAMA PARA LA DETECCIÓN DE CONDUCTAS ADICTIVAS Y VIOLENCIA EN EDUCACIÓN SECUNDARIA [HIGH SCHOOL VIOLENCE AND ADDICTIVE BEHAVIOR DETECTION PROGRAM]

The computer program was developed for PCs. The stories were written by the research group based on the results of prior analyses of the data collected from the various validated questionnaires. The images used were taken from several different websites offering open-access graphical resources.

The program, as shown in Figure 1, includes a registration screen in which the user must enter user and password for access, in addition to age and school. This is followed by a further series of items in which information on academic performance (if he/she has failed a year or not), participation of parents/tutors in school life, and the student's involvement in episodes of school violence (whether as aggressor, victim or observer) must also be given.

At the beginning of each session, the user enters his/her password for access to saved games. This way when the player begins a new session he/she can continue with new stories or take up the task where he/she left off without having to start at the beginning again (see Figure 2). This personalized menu also allows the user to see what games have already been finished and choose those still to be played (unshaded).

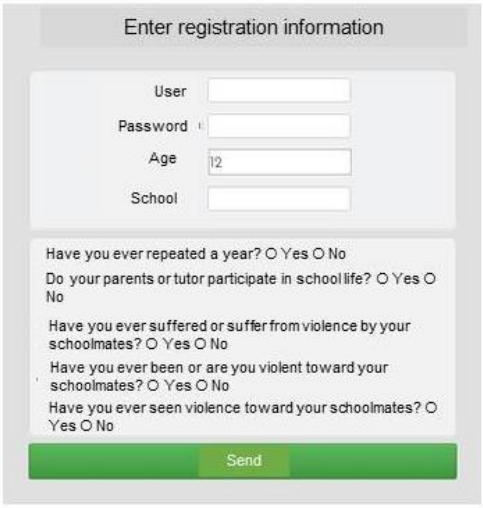

Figure 1. Program user registration screen.

Figure 2. Program story selection screen.

Figure 3. Game introduction to "*Bullying Rafa.*"

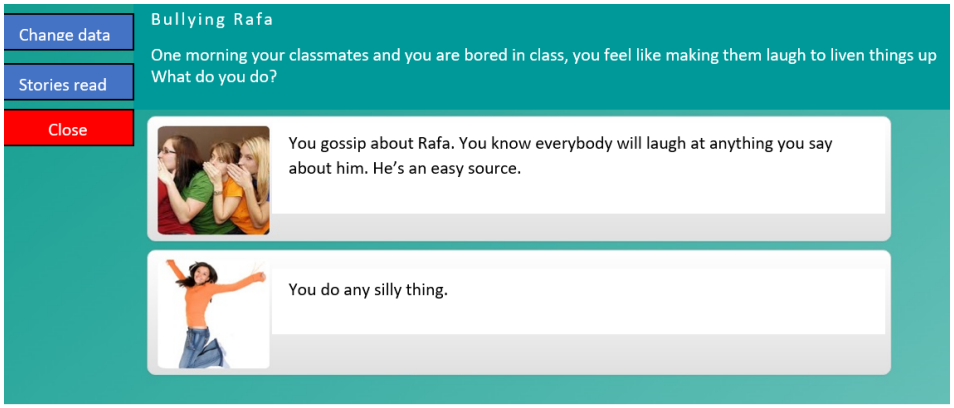

Figure 4a. Fragments from *"Bullying Rafa."*

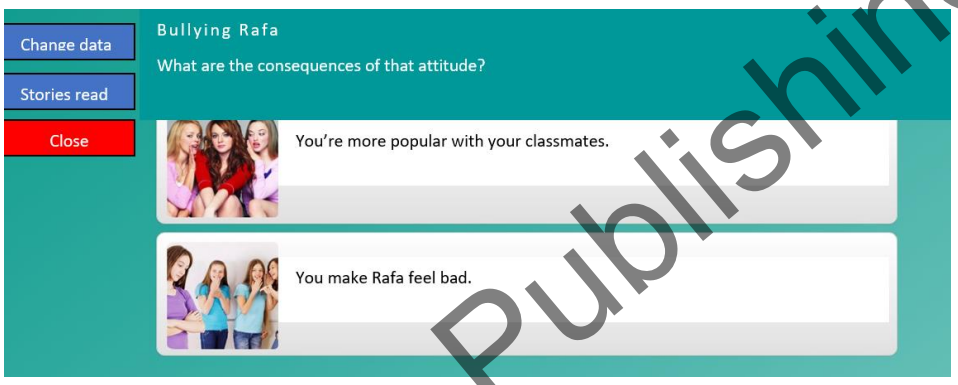

Figure 4b. Fragments from *"Bullying Rafa."*

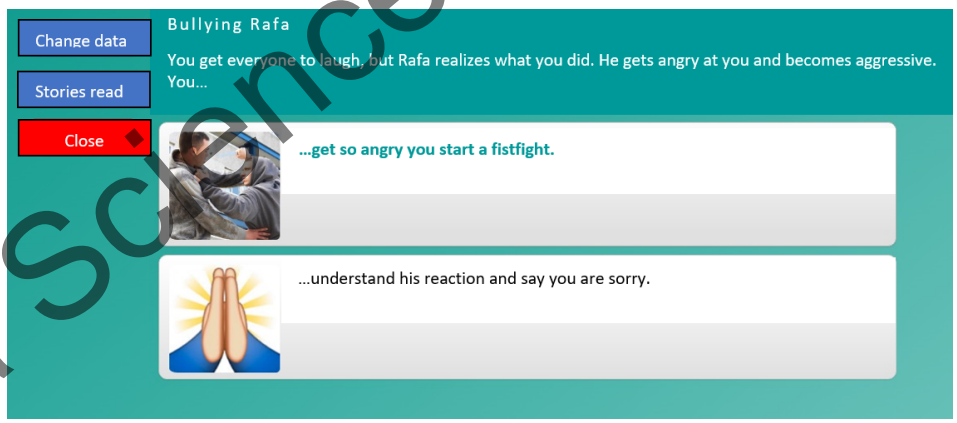

Figure 4c. Fragments from *"Bullying Rafa."*

As an example, some of the program screens shown during the stories are presented below. Figure 3 shows the introduction, which situates the player in the context where the story is going to take place, and in this case, tells what happened before the situation that is about to be presented (see Figures 4a, 4b, 4c). The player's answers decide how the story will continue and how it will end.

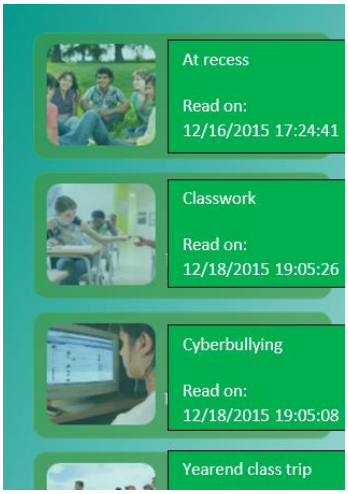

Figure 5. Application game record.

The application also has a game record which shades the stories that have already been read/played (Figure 5) on the story panel (Figure 2).

Finally, the program has a user statistics tool which saves the student's answers when the games are over. This creates a graphic of the scores on each of the scales for each case, showing the intervention needs or points that specifically need to be worked on for a given student.

CONCLUSION

The main advantage of this resource is the interactive nature of the evaluation process itself. In the case of the traditional methodology (paper-and-pencil questionnaires, scales or inventories), the subject perceives an evaluation in which he/she has to limit his answers to questions which he often does not feel identified with. On the contrary, when situations are inserted in a story, it also makes it easier for the subject to answer all the items, since it is the only way to continue with the story.

The High School Violence and Addictive Behavior Detection Program is an approach to the problems of school violence and substance use based on intervention specific to each case. Such information on the variables involved in the development and maintenance of certain adolescent risk behavior indicates points that need to be worked on to prevent the appearance of substance use behavior.

The main contributions of the instrument are the following:

- It offers information on the characteristics of certain use profiles and involvement in school violence.
- It enables needs for intervention to be found for each student without having to "label" them. That is, it makes it possible to find out what factors and which students require intervention.

Its practical application in acquiring information in a first detection stage, which facilitates development of a series of coherent patterns of action in each individual case, is extremely useful to teachers, counselors and psychologists.

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Chapter 13

UNIVERSITY DROPOUT: DEFINITION, FEATURES AND PREVENTION MEASURES*

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ABSTRACT

University studies are the highest educational level and promote the development not only of the person learning, but also of the society in which the person lives. Therefore, drop-out at this educational stage has serious consequences that justify research into the problem. This chapter attempts to delimit the problem and discuss its relationships with personal, academic, institutional and contextual variables. In order to facilitate an understanding the complexity of higher education withdrawal, we have illustrated our explanation with data obtained from the framework of the ALFA-GUIA European Project for a Comprehensive Management of University Dropout. Finally, the authors have outlined a series of preventive measures that have proven their efficacy over time and in a variety of institutions.

Keywords: higher education, university, drop-out, persistence

INTRODUCTION

University dropout is a global problem that has been noted by the international association of universities in more than 180 countries (UNESCO 2004). The consequences

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that this phenomenon entails transcend the individual and can include; a loss of family investment, psychological distress and implications for future professional possibilities, a waste of resources invested by the university itself and the society in which the student lives, as well as potential side effects like the slowdown of technological, scientific and cultural development of the country as a whole (Esteban, Bernardo, and Rodríguez-Muniz 2016).

This phenomenon, almost non-existent in the era when university studies were reserved to the social elite of the country, has been steadily gaining importance with the democratization of access to higher education since the mid-twentieth century. With the rapid rise in the number of overall college students, the characteristic problems of other educational stages have come to college level with them, including dropout.

Therefore, a growing number of pupils having not achieved the desired standards, succumbing to pressure, or considering that the cost-benefit of university studies do not generate enough practical yield, choose to drop out. That was the moment in which research began to emerge in an attempt to find an explanation for the phenomenon, first limited to a purely economic approach (Schultz 1961) and subsequently incorporating other perspectives such as psychological (Fishbein and Ajzen 1975), sociological (Spady 1970), organizational (Kamers 1971) and interactionist perspectives (Tinto 1975).

The rapid increase in world population and its development during the second half of the 20th century encouraged nations to establish policies to foster the growth of education, limiting this goal, firstly, to primary education, then subsequently moving on to secondary education, and finally – during the 80s- to higher education (Rama 2009).

As a result, the existing problems at the university level increased in magnitude, including dropout which has motivated the proliferation of research focused on a diagnosis of its causes and suggestions for its correction.

In Spain, the proliferation of research on academic failure and university dropout was enhanced through the establishment of the Organic Law 6/2001, of December, 21, of Universities (LOU). This law emerged out of the need to submit the university system to a profound structural and organizational reform, providing both skills and new governing bodies to universities, and highlighting the need to improve teaching, research, management and evaluation systems.

Despite these advances, the LOU proved unable to meet the European Union guidelines and with this objective the Organic Law 4/2007, of April 12 (LOMLOU) was created, amending the earlier Organic Law 6/2001. This new law (LOMLOU) re-organized the educational level in order to harmonize our higher education system with the rest of Europe, as well as establish new mechanisms to improve overall teaching quality (by making the access to teaching more flexible, providing the basis for the development of the Student Statute, creating the Student Council, etc.).

Later, University Strategy 2015 went one step further and presented a set of actions that favor "the modernization, the promotion of excellence and the internationalization of our university system" (Ministry of Education and Culture 2010), making the learning routes more adaptable by diversifying teaching methods to better fit students' needs and assuming the principle objective of developing lifelong education.

Finally, regarding the changes to the Spanish university system under the framework of European Higher Education Area, it is necessary to reference the Modernization Agenda for Higher Education in the European Union (European Commission 2006), where the application and development of the Strategy 2020 for EU Growth establishes important goals

for the educational sector including: dropout rate reduction to 10% overall, an increased graduation rate equal to 40% of the country's population, and significant improvements in teaching and research quality, etc. Thus, the dropout rate has become one of the main indicators of quality of the university system in general.

These ambitious targets have been presented in a context of severe economic crisis, which has required Spain, as well as other EU partners, to implement policies of cutbacks and rationalization of public expenditures. Therefore, maximizing the efficiency of the national educational investment has become an obligation.

Having reviewed the progress of research on university dropout and its ethical and legal constrictions, we should first clarify the construct of dropout and define its typology.

UNIVERSITY DROPOUT: DEFINITION AND TYPOLOGY

The most widespread and applied definition of academic dropout in Spain refers to the student who has started studies and, before completion, stopped enrollment (Cabrera, Bethencourt, Álvarez and Gonzalez 2006: 173). Usually, the absence of enrollment for two consecutive courses is set as a cut-off for statistical purposes.

The dropout rate is one of the most commonly used educational indicators to assess the internal efficiency of the University System (Villar, Vieira, Hernandez and Nunes 2012) and it refers to the proportion of students starting a degree and dropping out before completion, regardless of whether or not they begin other studies or not.

Therefore, this rate includes two transfer rates: change of program (but continuing to train in Higher Education) and dropout from the university system (which includes those who transfer to non-university levels, Ministry of Education Culture and Sports 2015).

It is also necessary to differentiate between voluntary and forced dropout, the former referring to students who decide to quit the initiated study program and the latter referring to students who are expelled from the university –either due to the disciplinary regime (e.g., academic integrity regulations), persistence regulations (e.g., requirement of achieved credits) or forced by external events (e.g., sickness or labor responsibilities which can interrupt attendance (Duran - Aponte and Pujol 2013). Sometimes, these students return to university when their personal conditions allow it; hereafter referred to as "stop-outs" (Tinto 2001).

In Spain, according to the Conference of Rectors of Spanish Universities (CRUE), Higher Education systems have evolved towards meeting the strategic objectives of the European Union: The dropout rate for the year 2013/14 was 24.73% (17.83% traditional universities, 44.23% open universities) which is a considerable improvement in relation to the almost 50% dropout rate observed in the 2008/9 academic year (Hernandez and Perez 2015). This quality indicator of the educational system is closely related to others, and in particular the academic performance rate – or the ratio between achieved and enrolled credits.

There is a considerable contribution that transfer rates (either within the same institution or not) reflect defections included in the degree dropout rate and other indicators which, in reality, do not imply a real dropout but rather a relocation. This rate, added to the corresponding proportion of pupils leaving a degree to pursue non-university studies (mainly by transferring to community college programs), shows the low proportion of students who, after deciding to drop out of the initiated university program, choose not to continue studying

at all (Villar et al. 2012).These types of transfers should not be understood as examples of a failure or a waste of time and resources, as this experience helps these students to try different options until they find one that best suits their needs and capabilities (Arriaga, Burillo, Carpeño and Casaravilla 2011; Villar et al. 2012).

Moreover, in the European context, with the implementation of the European Credit Transfer System (E.E.T.S.) which enhances mobility, these instances are often favored (Arriaga, Burillo, Carpeño, and Casaravilla 2012). Thus, part of the total university dropout cost —estimated at 8328 million Euros per year in Spain (Colas 2015: 12)—does not constitute a total waste of the investment, as it allows some of the students to discover their true vocation, while acquiring knowledge and skills that will serve as complementary education. By taking this approach, Villar et al. (2012) goes further in assessing the costs and profits that changing degrees has both for the student and the institution (see Table 1):

Table 1. Costs and profits of transfer

	COST	**BENEFIT**
STUDENT	- Waste of time in their academic career. - Cost due to extension changes - Risk of loss of motivation and consequent dropout.	- Clarification of knowledge about the degree/branch, self-knowledge and progress towards vocational definition. - Plurality of experience and multidisciplinary knowledge acquisition. - Extension of personal networks.
INSTITUTION	- Places are taken which will not continue, can sometimes be considered as waste. - Reduction in the system's efficiency.	- Students are more motivated and interested in their career. - Plurality in the classroom, improvement of the educational process. - Subsequent synergies thanks to interdisciplinarity.

Source: Own elaboration based on Villar et al. (2012: 160).

Based on the foregoing information, it is logical to think that students who undergo certain kinds of dropout may have certain characteristics in common with and others that differentiate them from other groups. In this sense, the study summarized in Table 2 performed by Arriaga et al. (2011) identifying and characterizing the six main types of dropout is particularly clarifying:

According to Vazquez (2013), it is important to identify the different characteristics of these groups and establish different measures based on a deep knowledge of these student profiles in order to effectively prevent dropout. Furthermore, as Arriaga et al. (2011) states, those students who are prone to transfer could easily turn into dropouts if they do not find what they are looking for. For this reason, it is highly recommendable to provide support for the student during this process via advising and career counseling in order to ensure the success of this second career path.

It is also necessary to take into account the longitudinal dimension of the phenomenon. To this end, Tinto (1988) has conducted a series of studies on higher education withdrawal, which have compared the transition from high school to college to the ancient rites of passage that symbolized the transition of individuals from one social group to another (a process described by Van Gennep 1960). Therefore, the new student must go through a process of

adaptation to this new academic and social environment, while navigating through the difficulties of their personal journey and facing a higher risk of isolation and dropping out.

The research methods that Castaño, Gallón Gomez and Vasquez (2004) applied to their study of the longitudinal dimension of the problem included a number of survival analysis and duration models which are most commonly used in the field of medicine. Through this line of testing, the authors were able to calculate the risk of dropout in each semester, which confirmed a progressive decrease as the student advances in the program. Meanwhile, Willcoxson, Cotter and Joy (2011) studied a group of freshmen in Business Studies from six different universities throughout the first three years of their programs. Their findings allowed for the identification of the influence of different variables on the phenomenon depending on the time at which the dropout occurs.

Table 2. Dropout types, possible consequences and recommended actions

PROFILE	IN FAVOR	AGAINST	ACTIONS TO BE IMPLEMENTED
TEMPORARY DROPOUT OF DEGREE (STOP-OUTS)	Satisfied with the university Feeling of accompaniment and membership	Emergence of external commitments or unforeseen situations	New ways to coordinate the study with working life and family
CHANGE OF DEGREE, SAME UNIVERSITY	Satisfied with the university and the education received	Low- resistance to pressure	Personal guidance for relocation (preventing the change from turning into dropout)
SAME DEGREE, CHANGE OF UNIVERSITY	High academic commitment High- resistance to pressure Appropriate prior preparation	Dissatisfaction with the university Low connection with the institution	Change student's view of the university
CHANGE OF DEGREE AND UNIVERSITY	High academic commitment	Low integration and sense of belonging Unrealistic expectations about the degree	Actions for integration Personnel actions and academic orientation
CHANGE OF EDUCATIONAL LEVEL	The university experience helps reorient their vocation Satisfied with the university	High sense of pressure Frustrated expectations Feeling of not fitting in at university	It is not possible to intervene with uarantees
DROPOUT FROM ALL KINDs OF STUDIES	They do not have a negative image of the university	External commitments Low perception of usefulness of studies	It is not possible to intervene with guarantees

Source: Own elaboration, based on Arriaga et al. (2012).

Regarding the incidence of dropout according to the year in which the decision is taken, a greater accumulation of dropout was observed after the first year, with a gradual decrease in subsequent years (Cabrera, Bethencourt, Alvarez and Gonzalez 2006). Therefore, the research on the phenomenon that is currently being conducted tends to focus on the study of voluntary dropout at an early stage (1st year), is generally limited to dropout from a university program or university studies, and considers a variety of variables (socio-demographic, personal, social, institutional, etc.). Consequently, many universities have developed First Year Experience Programs that are updated periodically to respond to the students' current needs (as an example, see Kift, Nelson and Clarke 2010)

Taking into account the extent of research that has already been done in this field, it is worth considering whether or not it is necessary to continue contributing to development of knowledge in this field. However, given the complexity of the phenomenon and its contextual character, as well as the aforementioned recent changes in the Spanish higher education system, it is no doubt essential to continue studying dropout rates in higher education (Di Pietro 2006). The following section outlines the Alpha Project for the Integrated Management of University Dropout, and details the results obtained at the University of Oviedo in the research implemented in the context of the GUIA Project as an example of the already commented characteristics.

THE ALFALFA-GUIA EUROPEAN PROJECT FOR A COMPREHENSIVE MANAGEMENT OF UNIVERSITY DROPOUT

The GUIA project, funded by the European Union (DCI- ALA / 2010/94), aims to address the problem of higher education dropout from an holistic approach thanks to a network of twenty Latin-American and European higher education institutions, which is coordinated by the Polytechnic University of Madrid.

The project follows four lines of action: "[1. to promote a better understanding of the causes of dropout so that it can be predicted more accurately, 2. to evaluate and disseminate the best available practices, 3. to integrate them into the institutional improvement programs, and 4. to engage all of the different agents involved" (Arriaga, Casaravilla and Burillo 2014: 6). Within the framework of the first line of action, an international research project has been developed, with the participation of 20 higher education institutions, 16 of which have applied an adhoc questionnaire and gathered data from one or more freshmen groups a few years after their entrance to the university system.

The aim of the research was to identify the variables that have the greatest influence on the phenomenon of dropout from a variety of different perspectives. In this chapter, the results obtained by the University of Oviedo are provided relating to peculiarities of dropout depending on the year of study in which it occurs.

Participants

As already mentioned, the complete sample of the research developed under *ALFA-GUIA* Project came from 16 institutions and included a total of 9,982 subjects (of whom 7065

dropped out and 2917 took part as control group). Participants were selected from 2008/9, 2009/10 and 2010/11 groups of freshmen.

The University of Oviedo contributed 715 participants to the project sample (drop out group N = 541 and control group N = 174). A stratified random sampling was applied, taking as strata the areas of knowledge defined by UNESCO. Therefore, our sample is representative of its population and allows for generalization.

Instruments

The instrument used to collect the information was an *ad hoc* questionnaire, which is available at the ALFA-GUIA website (Project Guide and Group of Analysis 2013). The questionnaire gathers information on 210 variables and is based on the following structure:

- **Block 1:** in order to reduce the number of questions asked to our participants, as well as to gather information about the student performance and academic condition more efficiently, the questionnaire was comprised of one block of 14 closed items to be answered by the institution.
- **Block 2**: which aims to gather general information from all the participants about their personal, cultural, academic and economic characteristics, as well as others related to their university experience and academic situation in general. This block was comprised of 33 items of three different types: 1. Closed items with two or more alternative responses; 2. Likert-scale items; and 3. Open items, to allow taking notes about the itineraries followed after withdrawal. Results presented here correspond to the information gathered by these first two blocks.

Furthermore, the questionnaire included two additional blocks the results of which will be presented in future analysis including: 3. Positioning block, which aims to obtain the necessary information to redirect the participants to the right specific questions bloc; and, 4. Specific Blocks, that include specialized questions regarding ach possible academic situation (persistence, transfer or drop-out).

Procedure

Data collection at the University of Oviedo was carried out by combination of two procedures: requesting personal information from administration services and the application of the questionnaire through a process of computer assisted telephone interviewing (CATI). Some of the participants in the ALFA-GUIA Project used complementary procedures in order to achieve a greater level participation in the study. In particular, these institutions have either presented the questionnaire in on-line format or have carried out personal interviews.

Statistical Analysis

Since the aim of the study was to discover the peculiarities of dropout depending on the year in which it takes place, the use of control group data was excluded from the statistical analysis on this occasion (since it consisted of students who had not quit their respective university programs).

Consequently, the study was performed using a sample of 541 students who had dropped out, obtaining accurate information about 509 of them, determining the course taken after which the student decided to drop out. A statistical analysis was performed using the SPSS program (version 21, IBM Statistics) indicated below. Five dichotomous variables were created, corresponding to each type of dropout, and re-classified the sample consequently. Thus, every type of dropout was studied against the rest of categories.

Moreover, a descriptive and correlative analysis was conducted on all the variables of the first questionnaire block (common block), reviewing the possible relationship that these variables might have with each type of dropout (regarding the academic year in which it takes place).

Results

The following results are related to dropout features in our institution, regarding the year of withdrawal (established based on re-enrollment data). In our sample, we found that 31.69% and 36.02% of dropouts occur in first and second year of studies respectively (67.72% overall). As highlighted in the previous section, among university programs, the dropout rate tends to be highest in the first two years of university. Moreover, there is a 19.29% dropout during the third year, 11.22% in the fourth, and 1.77% from fifth or subsequent years that should also receive attention.

We have also identified a second sense of dropout with a longitudinal character, the one that regards the decision making process, as these kind of choices hardly ever are made suddenly and, therefore, are influenced by other changes in the student´s life or social context. Taking into account the year of access and the last year in which each participant was enrolled in the same undergraduate program, we determined their dropout stage. With this information we carried out a correlative analysis in order to discover the possible relationship between the year of dropout and variables from Block 1 and 2 (personal, academic, economic, institutional, and cultural variables).

From the results obtained, variables that were statistically significant to the dropout (at least $p < .01$) were selected and synthesized. As can be observed in Table 3, dropout after first year of university studies seems to be influenced by a greater amount of variables than in subsequent years. Here on, we will examine each dropout related variable, discussing our findings with the ones obtained in other remarkable investigations.

As Tinto (1988) highlighted, students arriving to higher education are going through not only a complex process of adjustment to the institution itself, but also to the many difficulties that are often associated with university life in general. A lack of adjustment to the institution often has remarkable consequences and has been closely associated with program withdrawal in previous research (Braxton, Millen, and Shaw 2000; Bethencourt, Cabrera, Hernández, Álvarez, and González 2008; Duncan 2006; Willcoxson et al. 2011). Considering this

evidence, we explored whether there was a link between adaptation to university and dropout (in both dimensions; social and academic). We found statistically significant differences but only among the group of pupils who quit in the first and in the fourth year of their university studies, and only in terms of academic adaptation. This is the unique variable that seems to be clearly associated with late dropout. These results may be explained by two main reasons: Firstly, most of participants declared a good level of social adaptation and a pleasant social environment; and, secondly, since our university rules state a minimum of achieved credits in order to permit re-enrolling ones students finished their first and third year of university studies (persistence policy also allow to match this requirement), those students unable to reach this minimum are expelled.

As already mentioned, dropout is a phenomenon that is affected by the context (institutional, socioeconomical, political, etc.) and as a result an enormously ambitious European educational reform has recently been undertaken with the establishment of the European Higher Education Area (EHEA). One of the main changes under the EHEA includes a fundamental change in the conception of education, which shifts the attention from teaching to learning, from professors to students. This conceptual change has had a major impact on university organization at all levels, and specifically to teaching content and methodologies. Furthermore, the EHEA promotes autonomy and other remarkable competences (team-work, I.T. skills, language acquisition, etc.) and seeks to promote the role of active methodologies as an important tool in order to achieve these goals (Díez 2009).

Within the context of the ALFA-GUIA Study, we looked into this by asking participants about the most common teaching methodologies they found in their courses (master lesson vs. active methodologies). Contrary to our expectations (based on the findings of Braxton et al. 2000), in our study dropout and active methodologies are actually related. This link between teaching methodology and dropout rate exclusively affects first two years of university, so it may be due to the students' lack of experience with this form of learning or to a poor implementation of the specific type of active learning.

Table 3. Correlations between year of withdrawal and variables from blocks 1 and 2

	1st YEAR	2nd YEAR	3rd YEAR	4th YEAR	5th YEAR
Academic Performance[1]	✓	✓			
Teaching Methodology	✓	✓			
Academic Adaptation	✓			✓	
Satisfaction with the Courses Contents	✓		✓		
Satisfaction with the Teahcers' Quality	✓				
Satisfaction with the Global Educational Quality	✓				
Satisfaction with Rules and Regulations Regulations			✓		

Source: Own elaboration.

Turning now to academic performance during university studies, a variety of literature has highlighted its association with the problem addressed in the present study, as academic

[1] Mean of univesity credits passed each year of study.

performance has been demonstrated to be related to dropout in almost every study done on the subject (see literature reviews of Spady 1970, and O'Neill, Wallstedt, Eika, and Hartvigsen 2011 as an example) and has even been categorized as a predictor of university program withdrawal (Casaravilla, del Campo, Garcia, and Torralba 2012). In our sample, poor academic performance (in terms of passed credits) was found to be significantly related to dropout in the first two courses. These results can be explained by a reduction of the variance as a result of first and second year withdrawal. Regarding our findings, it is highly recommendable to promote learning and academic achievement and, in this sense, some useful recommendations are highlighted in the next section.

Having have explained the relationships between academic adaptation, teaching methodologies and student performance with dropout, its important to consider student satisfaction: De Shields, Kara and Kaynak (2005) point out that since the degree of student satisfaction is affected by their overall university experience (at the social and academic levels), it is necessary to deal with both aspects to promote continuity in university studies. Looking into the fist of them, no correlation was found between year of dropout and the students' social adaptation; this is probably due to the satisfaction our students affirm to have with the social atmosphere of our university and their social adaptation. Despite of it, group participation and social adaptation play a central role in the phenomenon, as it influences other variables that are directly correlated to dropout (see Esteban, Bernardo, Tuero, Cerezo and Nuñez 2016).

Moreover, student satisfaction regarding academic features seems to contribute in a significant way to dropout; as highlighted by Nevill and Rhodes (2004) student satisfaction with the university experience appears to be linked to continuity/persistence in many studies, particularly in regard to teaching and learning, workload, support and financial issues. The international ALFAGUIA study included a series of items inviting pupils to rate their satisfaction of several aspects of their university experience. In light of our results, it seems that only some aspects of satisfaction directly correlate with dropout in certain courses: Satisfaction with the institution´s educational quality had a significant relation to dropout rates in the 1st and 3rd year (while it was insignificant for the 2nd, 4th, and 5th years). Although literature shows how this factor is important throughout the entire undergraduate studies period, a reduction of the variance was found after the first year of university in our sample.

Regarding dropout in the 3rd course, two more associated variables were identified (related to "course contents" and to "university rules and regulations"). Lower satisfaction with these aspects increased the risk of dropout. These results coincide with those of Elliot and Shin (2002) and Suhre, Jansen, and Harskamp (2007), which found that in our university can be explained by mandatory courses (to be passed as a condition to progress in the program) and persistence policy (minimum of passed courses required in order to permit re-enrollment). These kinds of policies are unpopular among students and, in fact, the University of Oviedo is currently reforming this policy, while collaborating closely with student unions, as more than one hundred students are expelled each year because of them.

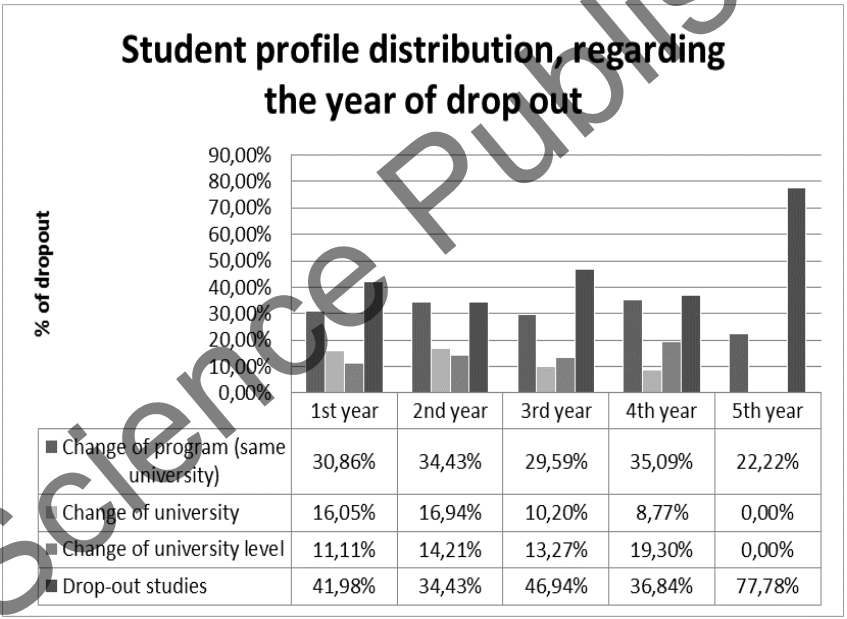
Based the aforementioned data, our dropout phenomenon seems to include a greater amount of variables, especially when it occurs at an early stage. Therefore, it is important to inquire into the dropout reasons in our sample; correlation analysis.

Once we have explored the relation between dropout and several variables related to the university experience, thought should be given to the action taken by the students after withdrawal.

As commented in the previous section, many students that quit their university program, do not quit studying all together: In our sample, a 59.7% of withdrawals transfer to another program (32.2% program transfer, 14.1% change of university, 13.4% enrollment in lower educational program). Figure 1 shows the participant distribution regarding type of dropout and year of study in which it occurred. Despite the fact that the relation of the dropout profile and the year in which it occurs is not statistically significant, these profiles should be borne in mind with regard to the establishment of future intervention programs.

Summarizing these findings, we can confirm that most dropouts occur at an early stage (67.72% during their first or second year) and that a bigger amount of variables play a role in first year withdrawals, in comparison with those occurring in subsequent years.

As a result of the information acquired on dropout thanks to research findings, it is possible to establish preventive measures. In this sense, as highlighted by Esteban, Bernardo, Cerezo, Tuero and Nuñez (2016), it is important to bear in mind the different types of dropouts and their corresponding student profiles in order to successfully establish specific measures. As a partner to the European Project ALFAGUIA, The University of Oviedo has had the opportunity to learn about many prevention mechanisms. In the following section, we illustrate the ones that we believe are the most relevant.



	1st year	2nd year	3rd year	4th year	5th year
Change of program (same university)	30,86%	34,43%	29,59%	35,09%	22,22%
Change of university	16,05%	16,94%	10,20%	8,77%	0,00%
Change of university level	11,11%	14,21%	13,27%	19,30%	0,00%
Drop-out studies	41,98%	34,43%	46,94%	36,84%	77,78%

Source: Own elaboration.

Figure 1. Student profile regarding year of studies in which withdrawal occurs.

UNIVERSITY DROPOUT PREVENTION

Several authors admit that higher education institutions not always develop a good praxis in regard to dropout prevention, as the actions they take are often biased and not integrated with institutional strategies or policies in many cases. It is essential to include student

persistence and completion within a broader institutional approach is in order to guarantee the long-term effectiveness of their interventions (Veenstra 2009).

In previous sections we have defined dropout and other related behaviors (transfer, stopouts), described the current educational context in Europe, commented on the main features of withdrawal as a phenomenon and analyzed its peculiarities in regard to the year at which it occurs, with help from ALFA-GUIA Project data. The following section reflects the conclusions that have been drawn in order to implement intervention strategies:

1) As there are several types of dropout and not all of them quit studying completely (transfers), it is necessary to implement measures aimed at promoting academic persistence to the entire population of students and not just to a part of them.
2) We also have to admit that the causes of dropout are not limited only to the characteristics of the students that leave and their situations, as their educational background also plays an important role in the explanation of their decision.
3) Research findings highlight learning and achievement as key contributors to persistence and, therefore, it is necessary to involve the entire institution in fostering educational excellence (Tinto 1999; Kuh, Kinzie, Buckley, Bridge and Hayec 2011).

To respond to each of the needs above, a series of specific measures are proposed in the following section. In order to favor a deeper understanding of the problem and facilitate the institutional management of students at risk of dropout, the establishment of early alert and detection systems is essential. Recognizing the influence of the context on dropout, we will offer a series of studies that show how financial aid programs can have a positive effect in dropout reduction. Last, in response to the need of an integral education for all students, we propose the promotion of student guidance services and several additional measures that further enhance the educational quality of higher education institutions.

Screening and Early Warning Systems

As it is often difficult for faculty to detect students' personal characteristics and difficulties, Hoff, Olson, and Peterson (2015) have proposed implanting a dropout screening and early alert system to identify students at risk of dropout. These systems have proliferated and are usually one of two types:

- Faculty driven, which have the advantage of identifying both high and low risk students, but depend on the faculty willingness and are not always applied at an early stage.
- Technology driven, which are designed to screen the entire population and need to be based on an institutional knowledge of the problem and often take into account previous educational stages (in particular, high school results).

Research findings on the phenomenon contribute to the accuracy of screening systems, providing variables that have proven to influence dropout and that can be considered as risk factors. In this regard, as stated by Bernardo et al. (2015), although the methods applied to educational research guarantee the reliability of the findings and, therefore, can be used as

predictors, it cannot be forgotten that these variables are often affected by context (economic, social and familiar contexts affect our students) Therefore, it is necessary to periodically update both research into institutional dropout and the efficacy of these early alert systems.

Also, as Hoff et al. (2015) have suggested, dropout is a process that can begin as soon as students enter education, as many factors involved in dropout occur throughout the entire schooling period, but taking into account variables related to behaviors prior to university entry entails assuming a static view of the person and their circumstances, leading to misclassification of students in some cases (Jwerald 2006). Therefore, it is more advisable to develop a system that includes longitudinal data to allow modifying the risk estimation as the student, the institution, or the context changes over time (Jerald 2006:9).

After the at-risk students are detected, the institution should implement research-based interventions, in order to promote more effective preventive and corrective measures (Olson el al. 2015: 7). In the next two sections, we will look into different kinds of student-affairs services which, being based in a proper screening system, can greatly contribute to reducing withdrawal rates.

Financial Aid

Access to higher education has always required a considerable investment, both for society and for the student's family (Sen 2000). This effort had decreased in the second half of the 20th century, thanks to the democratization of access to higher education. Nevertheless, students and their families continue to bear a considerable portion of the cost in Spain (Decree 41/2015). As a result of worldwide economic crisis, Spain is among the European countries where the risk of poverty and inequality has increased the most (MSSSI 2014). Therefore, it is reasonable to suspect that the influence of economic and labor factors has increased dropout rates. Indeed, as the Rectors' Conference of Spanish Universities (CRUE) states that there has been a considerable decrease in the number of enrollments in Spain in the few last years, which might be explained by this (Hernández et al. 2015).

Regarding whether students' economic resources determine higher dropout rates, several studies have reported less influence of economic resources during the period since the Spanish transition (Cabrera, Bethencourt, González and Álvarez 2006). However, the current situation of economic crisis has strengthened this factor. For instance, Esteban and Bernardo (2016) state that not having enough resources to afford living expenses multiplies the likelihood of student dropout by six.

Therefore, we recommend the careful implementation of a scholarship system because, as it has already been verified, economic aid minimizes the financial investment assumed by families and contributes to student persistence, making it an essential element of social promotion policies (Chen 2008). In Spain, the percentage of students that declare having trouble covering the costs of their studies is not excessively high (e.g., 11.35% in our study), given the global financial crisis. However, economic and related variables are quite frequent (for instance, in our sample, 22.47% of students had entered the labor market) and they also influence degree dropout rates (Elías 2008; Goldenhers, Coria and Saino 2011; McInnis 2002). Thus, at the very minimum, we recommend establishing some measures to ease the strain of reconciling university studies and work (such as not penalizing absenteeism, more flexible classes and tutoring schedules, using the virtual campus as a learning tool, work-for-

scholarship programs, etc.) In order to reduce the impact of low income on student dropout, the most effective programs take into consideration the hidden cost of higher education attendance, as proved by Goldrick-Rab, Kelchen, Harris and Benson (2016). Similar results were been obtained by Oloriz, Fernández, and Ameda (2013), who found that the university dropout rate decreased as financial aid levels increased.

Student Guidance

Student counseling and guidance services have often developed unevenly across countries and educational stages. In Europe, and in particular in Spain, the role of this educational function is fully recognized in Primary and Secondary Schools, but not that much in higher education institutions. Salmeron and López (2000) affirm that Spanish university guidance services are result of the particular institutional view of higher education and counseling services.

In Spain, these services started receiving governmental attention in the 1970s, with the creation of Career Guidance Centers within the universities. This attention increased thanks to the Organic Law of University Reform (LORF, 11/1983), which highlights the need to connect universities to the real world and promotes the expansion of guidance services.

Guidance services are understood to be an essential element of educational programs, which have a responsibility to study and intervene in students' academic, personal, social and professional issues or concerns. In addition, we believe guidance must be an ongoing process that starts from the earliest stages of the educational system and continues until adulthood (Do Ceu 2010; Echeverri 2013; Santana and Feliciano 2009). While it is not the purpose of this work to synthesize all the previous research on this topic, we would however like to acknowledge the proposal of Salmeron (2001), which recommends developing interventions that focus the entire educational community.

Moreover, guidance neither starts nor ends with those specifically designed services but rather with teachers themselves. As professionals, they maintain a daily relationship with their pupils and, therefore, are in a privileged position to advise scholars (Narro and Arredondo 2013). Therefore, in an ideal situation, the teaching staff would be part of the guidance system and they would have to work in collaboration with the specific services (Salmeron 2001).

Tutoring — in its diverse forms —is an instrument within reach of the faculty that, as Rodriguez (2013) points out, allows teachers to fulfill both the expectations and interests of their students, determine their previous knowledge, their degree of comprehension of the subject, etc. Depending on the field and level, tutoring will have a different goals that will determine the necessary methodology, timing, and resources (García 2003). Examples include: 1. Academic tutoring, to provide academic information, as well as to monitor students' learning processes and to enhance its progress; 2. Career tutoring (professional): to orientate the student, helping to successfully design a professional project, and 3. Personal tutoring: to provide personalized attention to students who desire or need help in personal, educational, or professional concerns.

The Tutorial Plan of Action (PAT) is an organizational tool that helps to organize the tutoring process. There are four requisites for its successful implementation: (1) institutional support, (2) teacher training, (3) a basis on institutional needs assessment, and (4) the availability of mechanisms for its own evaluation and improvement (García 2003: 252).

Finally, peer-assistance and peer mentoring programs can be another extremely helpful tool, especially considering their proven effectiveness. These programs not only contribute to dropout prevention (Collings, Swanson and Watkins 2015; Sánchez, Bauer and Paronto 2006; Treston 1999) but they also generate benefit in terms of education and competencies for their members (Denisson 2000; Rodríguez-Planas 2012). In this regard, it is necessary to point out that such programs require developing institutional policies and procedures, instructing teachers, administration staff and students, and providing extra-resources in order to ensure their efficiency, as the Supplemental Instruction Program of University of Missouri-Kansas City exemplifies (see U.M.K.C. 2016).

These and a number of other dropout prevention measures should be integrated in an institutionally coordinated plan in order to ensure their efficacy (Tinto 2010).

CONCLUSION: LEARNING, PERFORMANCE, AND PERSISTENCE

The aforementioned preventive measures are intended not only to prevent higher education dropout, but also to improve educational results and the general social climate of the institution. From a cross-curricular point of view, Tinto (1998) summarized the requisites that an institution should meet to promote persistence effectively:

Firstly, it is necessary to ensure that students hold realistic expectations in terms of methodological contents, job opportunities, etc., and overall achievement. Research has highlighted the importance of drawing a life project based on a deep self-knowledge and knowledge of one's environment, thereby increasing the likelihood of reaching personal goals and achieving a happy life (Do Ceu and Rodríguez-Moreno 2010).

Secondly, taking into account students' possible shortcomings with regard to qualification demands (knowledge, intellectual capacity, study habit, competences, social skills, etc.), it is necessary to provide them with the necessary support to ensure their effective social and academic adaptation. Guidance services, tutoring and mentoring programs, appropriate staff training, assign specific funds etc. and in particular, the development of institutional policies are aspects that can contribute to the process of overcoming the difficulties that students face in their career path.

Thirdly, as the main target of education, is to guarantee the quality of learning, and university students have to acquire knowledge and skills at the highest academic level, developing a suitable teaching program is a must. Moreover, in order to match 21st century educational needs, universities should incorporate active methodologies and, hence, promote meaningful learning, academic engagement, a feeling of belonging, and persistence (Tinto 1999). Active learning can contribute significantly to higher education persistence levels (Braxton et al. 2000; Braxton, Jones, Hirschy, and Harold 2008), but sometimes students reach higher education without having has this kind of experience and therefore fail to participate (as happened in our research), preventing them from achieving the expected standards (Azevedo, Johnson, Chauncey, and Burkett 2010). In this sense, training in self-regulated learning can help scholars to plan their studies, apply adequate learning strategies, monitor and evaluate their learning, achieve better academic performance and engagement (Cerezo et al. 2009) in addition to greater persistence in higher education (Schiefele, Streblow, and Brinkmann 2007).

Fourthly, and linked to teaching quality, Tinto (1998) has highlighted the need to provide effective feedback to students, regarding not only their knowledge acquisition, but also their aptitudes and values as well.

Finally, active student involvement in institutional life —as members of the university community —promotes a feeling of belonging as well as the commitment to the institution. Research reports that participation in groups (academic, sports, support groups, etc.) contributes to university persistence (Esteban, Bernardo, Tuero, Cerezo, and Nuñez 2016).

All these strategies that contribute to student persistence and academic success are more easy to reach if we conceive higher education institutions as educational communities: According to Tinto (2003), it is important for higher education institutions to build Educational Communities and to establish collaborative pedagogy as a hallmark, promoting learning beyond the courses and programs, while always bearing in mind the difficulties that students may encounter.

In order to build a real Educational Community, in which the efforts, responsibilities, and the credit for success are shared by all its members, it is essential to reorganize the curriculum and its courses to promote collaborative learning experiences among students, teachers and any other group that plays a role in these communities (administration staff, parents, companies, etc.). The investment of human and economic resources involved in the process may be great, but the contributions of these programs to the improvement of educational results, social climate, and student persistence will be more than worth the cost (Tinto 1999).

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Chapter 14

FIRST YEAR RETENTION MONITORING AT THE UNIVERSITY

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ABSTRACT

The Polytechnic University of Madrid shows some concern about the problem of college dropout. This is the essential reason why it has been provided fonds for two cross-cutting projects in order to further explore the analysis of the problem and offer proposals to improve the rates of academic persistence. A large number of lecturers of the university have been collaborating on these projects over three years (2011-2014). This chapter addresses some of the results obtained. The work has been focused on the dropout happening after the first year of university, the moment of the higher dropout risk according to previous research. The first phase of the study has been devoted to a qualitative and quantitative analysis of factors associated with dropout. This has led to the conclusion that low academic performance as well as difficulties of integration, in the social and university spheres, are key aspects to explain college dropout. A clear relation between school absenteeism and dropout has also been established. On this basis, a group of teachers, whose classes show a high level of attendance, have been selected and, by means of surveys and personal interviews addressed to this group, a guide to good teaching practices, motivating academic persistence has been elaborated. Finally, the First Year Retention Rate has been considered as a quality indicator, and a sustainable protocol, for monitoring such indicator, has been established. To achieve this, an online software, ASIA[1a], has been developed. This tool, using the available university official data, automatically generates reports and creates profiles for the populations of academic persistence and dropout in each bachelor's degree.

Keywords: freshmen dropout, retention rate, academic performance, bachelor's degree

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INTRODUCTION

All the universities are concerned about dropout, which becomes a frustration for the students and their family environment as well as a lack of resources for the society. The analysis of the factors influencing the dropout has been the focus of considerable research activity. Tinto (1975) related the dropout to students' academic and social integration. From that time onwards, numerous studies have explored the factors affecting the multiple forms of the problem (permanent or temporary dropout, transfer to other studies…) and propose corrective measures to improve the integration at university (levelling or placement courses, support by teachers and peers, scholarship policies…). The introduction of the dropout rate as a quality indicator in the Spanish protocol of official degrees' verification (ANECA 2008) is well justified. However, the intricacy of the problem (see Villar 2011 or Stratton, O'Toole and Wetzel 2008) does not make this indicator an efficient tool to measure the impact of the different actions or interventions implemented by the institutions. A high number of these studies (Corominas 2001, Ryan and Glenn 2003, Díaz 2009 or Willcoxson 2010) confirmed that the most frequent university dropout happens over the first year. Therefore, it turns out interesting to propose a more specific quality indicator like the First Year Retention Rate.

Aware of the importance that Institutions give to the improvement of the retention rates among new students, there are many universities that establish strategies such as welcome activities and student's retention plans. In Michavila (2012) an analysis of the Spanish universities' welcoming policies is presented. The analysis shows that, in general, there are no systematic procedures to measure the impact of such implemented welcome actions on the retention of students.

The research methodologies applied to analyse the academic persistence and dropout can be based on both, the harnessing of the objective information available to the institution (Smith and Naylor 2001, Kuna, García and Villatoro 2010, Araque, Roldán and Salguero 2011 or Rohr 2012), and on interviews and surveys to students and teachers (Corominas 2001, González, Álvarez, Cabrera and Bethencourt 2007, Álvarez, Figuera and Torrado 2011 or Villar 2011). Despite the fact that the second method can provide very direct and valuable information, the first one is more sustainable for a systematic follow-up, since it does not require additional budget and allows for a high level of automatization. In a time of scarce public resources, budget cuts, and calls for more measurable outcomes, institutions of higher education are renewing their emphasis on student success initiatives and looking for software solutions designed to track and improve retention rates (see Brooks 2014, SPADIES 2016).

According to the prior studies, there are some variables that could influence the college dropout:

- Student demographics: Gender, age, marital status (Nora, Cabrera, Hagendorn and Pascarella 1996, Corominas 2001, Stratton, O'Toole and Wetzel 2008 or Belloc, Maruotti and Petrella 2011).
- Student incomes: Parents support, working status or financial aids (Stratton, O'Toole and Wetzel 2008 or Chen 2012).
- Academic performance: Educational background, access score, first-year academic achievement (Smith and Naylor 2001, Kuna, García and Villatoro 2010, Belloc, Maroutti and Petrella 2011, Rohr 2013 or Casaravilla 2013).

- Academic and social integration: Interaction with faculty members and peers, active participation in students' organizations or time spent on campus (González et al. 2007, Álvarez, Figuera and Torrado 2011 or Casaravilla, del Campo, García and Torralba 2012).
- Institutional factors: Faculty actions, welcome activities or academic advising plans (Berger and Braxton 1998, Tinto 2007, Casaravilla 2013 or Kori et al. 2015).

Furthermore, student's dropout and retention differs in different degrees. Technology, Engineering and Architecture (TEA) is a group of academic disciplines with some specific features:

- There is high demand for qualified graduates, but first-year dropout is a barrier to the adequate graduate production (Kori et al. 2015 or Christe 2016).
- Women are generally under-represented in TEA classroom. While 54.1% of Spanish undergraduate students are female, only 30.6% of Spanish TEA students are women (MECD 2014). The situation is similar in other countries (Díaz 2009 and NSF 2015).
- Mathematics courses are predominant during the first-year TEA experience. Difficult mathematics courses cause students to feel as they cannot succeed in engineering. Therefore it could be possible to improve the student persistence in engineering by providing a successful early mathematical experience (Brown and Burnham 2012).
- For TEA students, social activities outside the classroom may not play an important role in persistence. Christie (2015) found that first year engineering and technology learners felt academically connected to the campus, but had little interest in social relationships. It could be that the *number of friends* is not an important factor influencing first-year dropout at TEA studies (Kori et al. 2015).

The Polytechnic University of Madrid (UPM) offers more than 30 Bachelor Degrees related to TEA field. The interest of the UPM in the retention rates improvement has become evident since some years ago. This university has leaded some international projects, like the project GUIA (*Gestión Universitaria Integral del Abandono* [Integral University Management of Dropout]), within the framework of the European ALFA program. It has also financed studies linked to cross-cutting projects of Educational Innovation. The project *Análisis del absentismo y abandono en las titulaciones de grado en la UPM y propuestas para la mejora de los índices de permanencia* [Analysis of absenteeism and dropout in Bachelor's Degrees at UPM and proposals to improve the retention rates] was carried out over the academic year 2011-12, coordinated by Ana Casaravilla, and it counted with the collaboration of more than 80 lecturers from seven Educational Innovation Groups of the UPM. This project became an opportunity to carry out a deep quantitative and qualitative analysis of the factors influencing first-year dropout and their relation with the academic absenteeism, analysing in further detail the first-time freshmen cohort of the academic year 2010-11. It is important to highlight the integrative character of this work due to the fact that it does not consider the dropout as a responsibility solely lying on the students but on the whole institution. Consequently, the research presents a multiple approach from different perspectives, the students,' the professors' and the university's own viewpoint. The project

analyses the causes driving students to refuse academic persistence in a degree for which they, probably wishfully, registered in a beginning.

As a next step, a project entitled *El índice de permanencia como criterio de calidad y propuestas para rebajar las tasas de abandono en los Grados de la UPM* [The retention rate as a quality indicator and proposals to lower the dropout rates in the Bachelor's Degrees at UPM], was completed between 2012 and 2014 and coordinated by Alfonsa García, counting on the participation of six Educational Innovation Groups of the UPM. The basic goal in this second project was the definition of a protocol of institutional follow-up on academic persistence, included in the university's global quality plans, and the design of some specific measuring tools to improve the protocol's efficiency and sustainability.

The study population in both projects is the group of *First–Time Freshmen* (FTF), that is, the students who each year join the university system, for the first time, by registering in some of UPM Bachelor Degrees. The FTF registered in the same degree over the second year represent the *Persistence People* group.

In the next sections, the results obtained from these two projects are presented, as well as some suggestions that could guide the university actions and plans to promote persistence and reduce academic dropout.

FACTORS ASSICIATED TO DROPOUT AND ABSENTEEISM

One of the goals of the project "Analysis of absenteeism and dropout in Bachelor's Degrees at UPM and proposals to improve the retention rates" has been the study of the process determining the FTF's decision to leave their studies, their classes, and, in the last case, leave their degree. The factors affecting this decision and its consequences, together with the specific influence of the different teaching strategies to reduce the absenteeism and to promote persistence, have been object of study. In this regard, the adequate statistical tools have been used for the analysis of, both, the objective information derived from the data bases of UPM and from the professors, and the subjective information gathered by means of fieldwork, through surveys and interviews addressed to teachers and students.

The population under investigation consisted of all the 4953 FTF of the academic year 2010-11, signed on the UPM Bachelor's Degrees, among which 710 did not continue being registered for the next year in the same degree (*Dropout People*). Nevertheless, 139 students from this group kept being registered at UPM in the year 2011-12, although in a different degree, that is to say, they were transferred within the same university (*Transferred People*).

The variables considered for the analysis of dropout risk are the following:

- *Academic variables*: Degree program at which the student is registered in the academic year 2010-11; new degree in the year 2011-12 (in the case of transfer); number of subjects the student is registered for; number of taken and successfully completed credits in the 2010-11; order of preference when choosing the degree; year, cohort, and university access score; number of, both, subjects in which the student followed the continuous assessment system, and those in which the student has been assessed by only final test; class attendance (in a percentage of "lower than

30%," "between 30% and 70%," and "higher than 70%") and global assessment of attendance and evaluation tests over the academic year 2010-11.

- *Demographic variables*: gender, age, Spanish/foreign, working situation, integration in the university environment, strength in terms of expectations and level of commitment towards the studies. Due to lack of data, family and socio-economic variables have not been considered.

METHODOLOGY

Official data were collected from the IT services of the UPM, and the information about class attendance and assessment was gathered from the schools' administrative offices and from those professors who collaborated in the project. Direct information was also collected from lectures by means of a questionnaire, complemented with interviews to determine the actions motivating academic persistence.

In order to gather the students' opinion, a telephone survey (CATI) addressed to the study population (Dropout People) was used by means of random sampling and the application of a questionnaire designed by the project researchers and validated by other experts. The fieldwork was carried out between March and April 2012 and 258 surveys were completed, with a sampling error of ±5.08% and a confidence level of 95.5% for p=q=0.5. A selected control group representing the group of active students also completed 153 surveys, with a sampling error of ±7.97% and a confidence level of 95.5% for p=q=0.5.

A detailed qualitative study was later carried out working with a reduced number of Dropout People carefully selected to cover the different dropout profiles. A total of 12 interviews, with duration of one hour and thirty minutes, were conducted by experts, which allowed the further analysis of the factors motivating dropout.

The records of the 710 Dropout People, from 35 different degrees, were added to a PASW file. Then, an exploratory data analysis was conducted through simple frequency tables and cross-tabulations. Some conclusions are presented here below. Different types of analysis are currently being completed in order to extract more detailed information and establish causative models.

RESULTS

From the analysis of the registered data, together with the detailed interviews to the students, some results have been obtained with regard to the most influential factors associated with the decision to continue registered in the same degree and the options that can arise when deciding to leave it.

First Year Retention Rate: The percentage of persistence in the same degree in 2011-12 has been 85.7% and the percentage of persistence at the same university has been 88.5%.

University Access Score: This score is a key variable; it explains the 60% of dropout (coefficient of determination R-squared) and the correlation coefficient between this variable and the dropout rates is -0.77. Figure 1 shows the distribution of such score (minimum of 5 points and maximum of 14 points). The figure also shows how Persistence People present

higher percentages of students with better access scores. Furthermore, the average of the access scores among the Persistence People is 9.99 points, while for the Dropout People is 8.27 points.

Gender: The number of male students at UPM is higher than female (almost 70% of the total are male students). However, the proportion of students who remain is higher among female than among male (see Table 1). On the other hand, a higher percentage of women than men decide to transfer to other degrees within the UPM. A lower tendency towards absenteeism has been observed among women than among men.

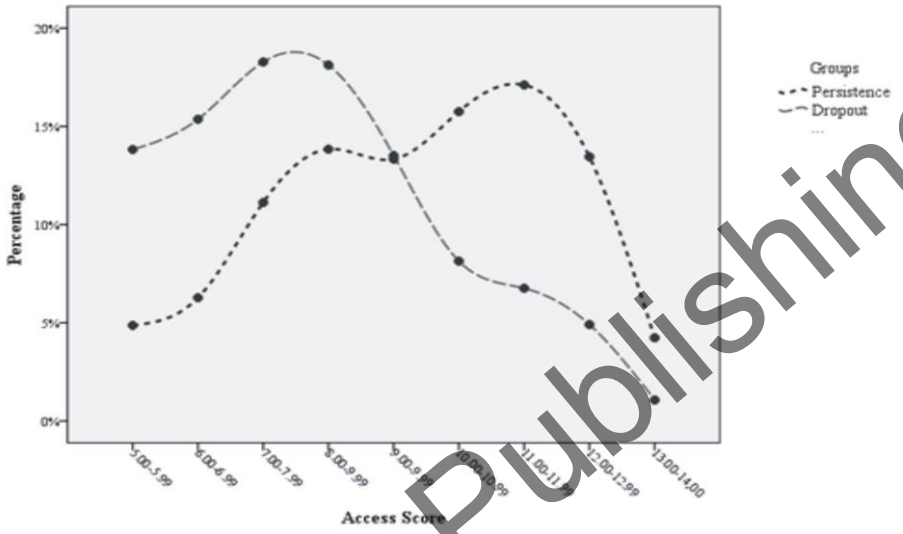

Figure 1. Persistence and Dropout People distribution according to Access Score (2010-11).

Table 1. Retention Rates and Gender (2010-11)

Gender	FTF	Persistence
Male	68.8%	84.8%
Female	31.2%	87.5%

Nationality: The retention rate among foreign students is considerably lower than among Spanish students (67.7% compared to 86.7%) although, since the number of foreign students is very low, this piece of data may not be significant.

Working Situation: The retention rate is higher among students who do not work. Approximately half of the Dropout People has a job, while only one third of the Persistence People has one.

Degree: The distribution of students who remain at university is not the same in all the degrees. The comparative aspect between the different degrees and the persistence is very interesting with regard to decision-making procedures on behalf of the university. The degrees presenting a low retention rate at UPM are those with a significant percentage of students who join the program late (second opportunity for entrance), as well as those where the students' average in the access score is unsuccessful. The highest retention rate is found in

Energy Engineering Degree (96.1%) and the lowest in Computer Engineering Degree (55.3%).

Access Option: The students' choice with regard to a specific degree is based on their perception that such degree's certificate is going to help them access to the labour market and acquire a high social prestige. There is not adequate information about professional opportunities, specialties, etc. to help the students to choose a degree with a guarantee of academic continuity. When registering for the preferred option at the university, the decisive factor is the degree's access score, the family pressure appears in a second place, and lastly the vocation towards such specific studies is placed. This does not favour academic persistence.

University Integration: The students admit the fact that they access to university with a great lack of knowledge about the institution and its procedures, and this makes integration difficult. Another factor, which can turn into a cause of dropout, is the fact that they have also to face a change of lifestyle, which makes them feel afraid and nervous about the new phase. The relationship with peers and professors, the feeling of membership in a community and the participation in extracurricular activities and clubs are considered important factors to get a better adaptation to the academic environment.

Academic Achievement: The average of completed credits by the students who remain at the university is 38.87 after the first year, while among the Dropout People this average is only 11.77 credits. It can also be stated that the students with a good academic performance continue in the system. The retention rate among the FTF who complete a number of credits higher or equal to 24 (of a total of 60) is 95.1%, while among those who pass less than 10 credits is only 41.3%.

Commitment: Both Persistence People and Dropout People consider the UPM as a demanding university. They also feel that the teaching methodology is rather traditional, and say that the professors, in general, do not encourage class participation, teamwork or self-assessment. Surprisingly, however, a great majority (81%) consider that the "university brand" is very important, and find that UPM is a high-prestige university.

Approximately 40% consider not have received enough training to enter at UPM and believe that remedial courses can be a good training to overcome low achievement. They also assume that study habits such as class attendance and continuous study of at least 2-3 hours per day, could guarantee more chances of success. Class attendance is an influential factor conditioning the dropout decision for 76% of Dropout People and 91% of Persistence People (see Figure 2).

More than 70% of Dropout People and almost 85% of Persistence People feel that continuous assessment, with activities and tests all throughout the term, is the best evaluation system. The fields of knowledge considered the most difficult are: mathematics, physics, computer science and graphic expression, which are present in a great variety of subjects in the different degrees at UPM.

Regarding professors' responsibilities for the students' low achievement, the students described great differences in terms of professors' profiles, class formats, and evaluation systems, and considered necessary for the professors to be dynamic motivators in the learning process. They also affirm that the institution should be more flexible with regard to the academic program for those students who work during college or are in vulnerable situations.

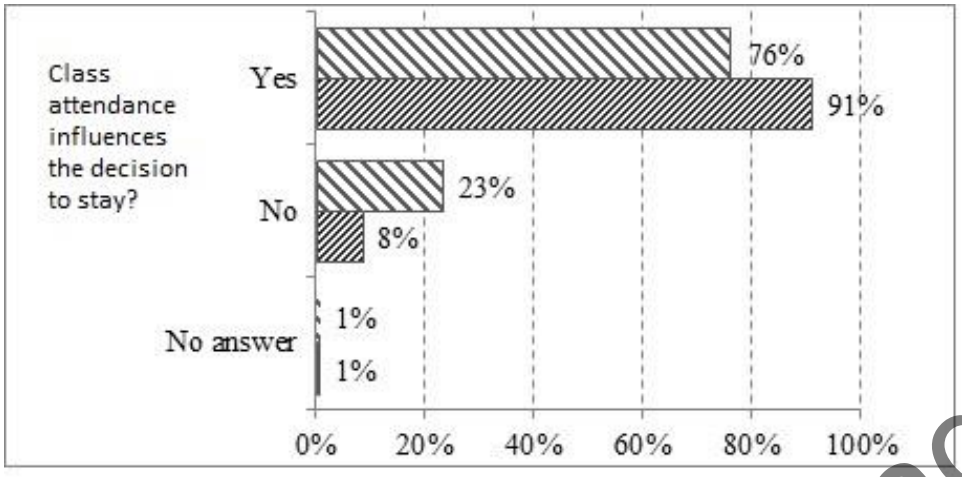

Figure 2. Class attendance influence in the decision to persist.

Options after the Dropout Decision

The project's fieldwork gave importance to the analysis of not only the factors conditioning dropout decision but also its consequences. The "seriousness" of the dropout decision is considerably different in the case of the students who decide to transfer to another degree compared to those who totally abandon of studies and leave the education system. In the first case, the dropout decision could even turn into a beneficial opportunity for the students and their family environment, although it can also involve serious problems for the institution if this becomes a routine. In the second case, the decision to finally exit the system can become a real personal frustration and represent a misuse of the institutional resources allocated to education. A summary of the results gathered from the survey in terms of options arising after the decision to leave the degree are found here below (from a total of 185 responses):

- 48% of the survey respondents decide to transfer to another degree at UPM, and 19% decide to register for the same degree at another university; 13% decide to move to non-university studies, another 13% decide to find a full-time job, and 2% consider returning to the same degree at UPM in the future. The rest does not know or does not respond this question.
- The students who have moved to another university to continue their studies generally show satisfaction feelings about the adopted decision. However, a third of the students who decided to move to another degree at UPM consider that they took the wrong decision, and 78% of them regret it (Figure 3).
- The students who have left the university system clearly value as negative and regret such a decision. They feel that abandoning university studies has deprived them from the opportunity to have access to a socioeconomic status and a social prestige, a factor that influenced their decision to enter UPM.

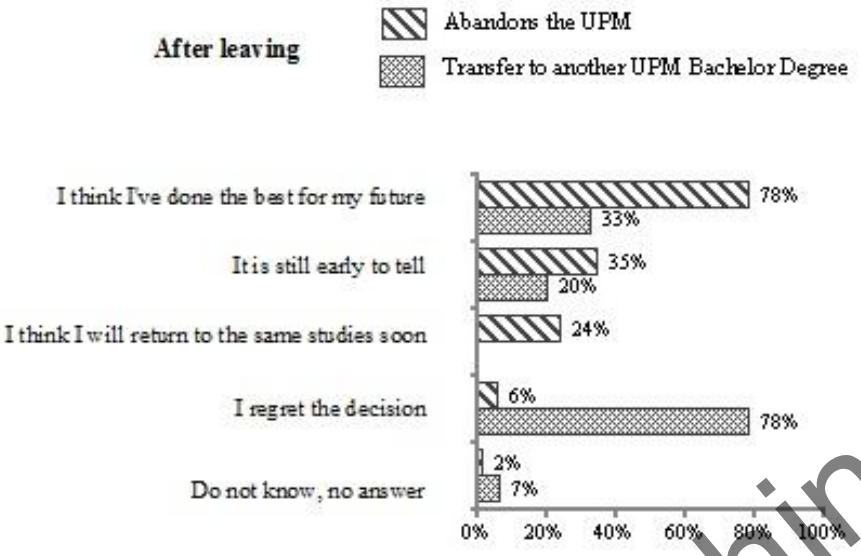

Figure 3. Assessment of the decision to dropout.

Guide to Good Teaching Practices

Another goal of this project has been the elaboration of a "Guide to Good Teaching Practices" to successfully promote persistence at the university. Many of the previous studies have confirmed that one of the most influential factors on the retention rates is the professor's attitude towards the students. Therefore, it is important to create this guide of motivating and learning-engaging practices. For this reason, once the relation between class attendance and academic dropout has been established, it seems appropriate to focus the research on the teaching practices of those professors who count on lower levels of absenteeism in their classes.

To elaborate the Guide, a form was given to those professors who had taught in the first academic year of the degrees at UPM in 2011-12. A total of 109 professors completed the form with attendance data of 130 subjects. Among them, 42 professors with a lower rate of absenteeism were selected and personally interviewed on the following aspects: course guide (information previous to the beginning of the course); transfer of knowledge; teaching support (guidance and student's follow-up, learning and motivation community); and evaluation process. A total of 33 completed the interviews. The analysis of the results determined the best valued teaching practices. These practices are listed here (see Table 2) and ordered according to the average score obtained in the surveys.

We can draw the conclusion that the professors with lower absenteeism emphasize the appropriate preparation of their teaching resources, the organized, attractive and sequential presentation of contents and activities, and the use of clear assessment criteria that respond to the students' workload. The professors point out that the students' retention is favoured by the creation of an atmosphere of respect and trust which encourages the exchange of concerns in class, together with an enthusiasm attitude towards the subject showing its interest for academic and professional issues to catch students' attention.

Table 2. Guide to Good Practices to improve persistence

Practice	Mean	Std. dev
I try to show enthusiasm towards the subject I explain	9.6	0.7
Learning activities are presented following a good sequential order	9.5	0.8
I treat all students with respect	9.3	1.1
Assessment criteria are clear, objective and well known by the students at the beginning of the year	9.3	0.9
I try to draw students' attention towards my explanations	9.3	1.0
I try to create an atmosphere of trust in class in order to favour the discussion of doubts, questions or learning problems on behalf of students	9.2	1.1
The teaching resources and documents available to students are sufficient to keep up with the subject	9.2	2.1
I try to make students feel that they can complete the subject with a reasonable amount of effort.	9.1	1.2
The learning guide is available for students from the beginning of the year.	9.1	2.3
I prepare the evaluation tests in accordance with the students' workload expected and mentioned on the guide.	9.0	1.3

First Year Retention Rate as a Quality Indicator

The results of the first cross-cutting project allow us to define the profile of dropout people, and to propose specific measures in order to reduce academic absenteeism and improve persistence. However, these measures should be part of the quality universities' protocols. "*Organizational attributes play an important role not only as a source of social integration, but in the first year persistence process*" (Berger and Braxton 1998, 116). The development of a model of institutional action "…*would require, among other things, not only more research in effective practice but also more research on the impact of organizational policies on student retention*" (Tinto 2007, 7). It is obviously necessary to define a set of procedures to measure the impact of retention programmes and determine specific corrective actions. Nevertheless, a limited budget only allows conducting studies based on questionnaires and interviews from time to time, on a non-systematic basis. Consequently, this type of tools cannot be considered for a sustainable protocol to analyse the impact of the adopted measures and identify changing circumstances. For this reason, the project "The retention rate as a quality indicator and proposals to lower the dropout rates in the Bachelor's Degrees at UPM" conceived the implementation of a sustainable protocol, following the diagram below in Figure 4, and the automatization of the systematic analysis of first year persistence and its relation with the variables influencing dropout.

The quality indicator *First Year Retention Rate* has been defined by the quotient *Number of Persistence People*/*Number of FTF* (García et al. 2013). It is an objective quality indicator that can be obtained from the available data at the university. It is also a significant indicator since the "…*completion of the first year and enrollment in the second year appears to have a significant impact on long-term persistence and the likelihood of obtaining a degree*" (Stratton et al. 2008, 319).

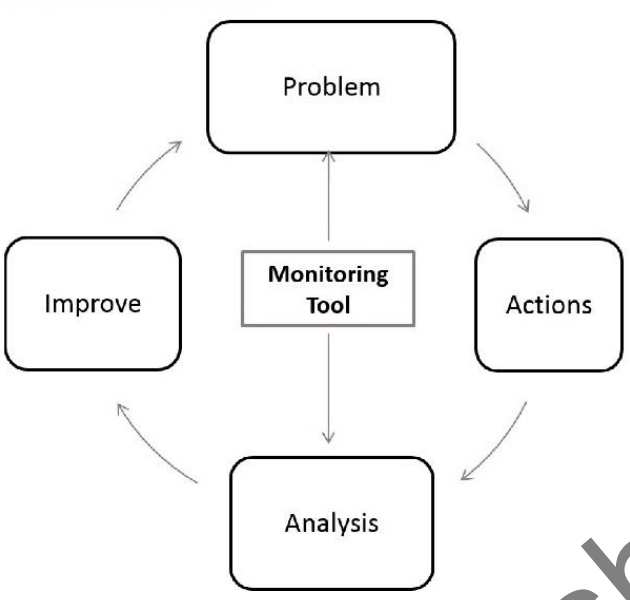

Figure 4. Protocol for a quality indicator monitoring.

The systematic monitoring of dropout is a key to success in preventing policies. In order to create a monitoring tool, it was decided to use information and communication technologies for allowing data analysis easy and inexpensive. The objective was to organize, relate and analyze the data about FTF collected and stored by the university.

A Spanish online free software to monitor persistence has been developed. It is called ASIA[1a] (*Aplicación para el Seguimiento Institucional del Abandono de 1er año* [Software for First Year Dropout Institutional Monitoring]) and it is available on http://permanencia.etsisi.upm.es/index.php.

ASIA[1a] has been developed using PHP language, with visual frames in HTML, CSS and Javascript. The information is stored in MySQL data bases. It is a web-based software that automatically generates statistics and reports about the first-year retention rates in the different Bachelor's Degrees at UPM, and it relates them to demographic and academic variables selected according to the following aspects:

1. Their proven influence on dropout.
2. The fact that they are easy to evaluate with the available data at the university.
3. Their ability to inform on the impact of the suggested actions.

The considered variables are:

- *Bachelor Degree*.
- *Dropout/Persistence*: Binary variable, with value 0 if the student is registered in the same degree the year after entering university, and value 1 in the opposite case.
- *New Bachelor Degree*: Text variable defined only for the case of students transferred to other degrees within UPM.

- *Age*: Numerical variable indicating students' age when entering university, grouped in ranks [18, 19], [20, 21], [22, 25], older than 25.
- *Gender*: Binary variable with values woman/man.
- *Nationality*: Binary variable with values Spanish/foreign.
- *Access Option*: Variable with values 1, 2, or "higher" depending on the student's degree selection order.
- *University Access Score*: numerical variable, with values between 5 and 14 points, grouped in the ranks [5, 7), [7, 9), [9, 14].
- *Academic Achievement*: Numerical variable, with values between 0 and 60, representing the number of credits completed by the student in the first year. It is defined as following: failure, when the completed credits are in [0, 10), low achievement, [10, 24) and acceptable achievement [24, 60].

As population, ASIA[1a] works with the total of FTF from each academic year. An anonymous data base is built, using the files from the official data, sent by UPM to the Spanish Integrated System of University Information. Its records are the FTF's labels and its columns include the data related to the considered variables.

After accessing the website's main page, four basic options can be selected:

1. *University's general report*
2. *Report of a degree*
3. *Enquiry about persistence with one parameter*
4. *Cross search with two parameters*

The university´s general report for a selected academic year includes:

- Table with basic data of FTF signed on all the UPM's degrees.
- Comparative chart of first year retention rates in each degree.
- Chart with the average access scores for each degree.
- Differentiating chart for the average access scores among Persistence People and Dropout People.
- Several informative charts of persistence/dropout related to the variables: gender, age, nationality, access score and option.
- Several informative charts of persistence/dropout, related to the variables of academic achievement.

The specific report for each degree is equivalent to the general report, but it offers the data of a selected degree and compares them with the global university data.

The third option allows the user (professor, researcher or manager) to make particular enquiries about the impact of every variable on the retention rates for a degree or a group of degrees. The fourth option allows users to make cross enquiries with two variables.

Example of Use 1: Cross-Cutting Study, Comparing Several Bachelor's Degrees

To show the influence of the first year academic achievement on the retention rates, three bachelor degrees with very different retention rates over the academic year 2012-13 have been compared. Table 3 shows basic data (number of FTF, percentage of women, retention rate and average access score).

Table 3. Three UPM Bachelor Degrees (2012-13)

Bachelor Degree	FTF	Female	Persistence	Access Score (Average)
Mechanical Eng.	83	14.4%	91.57%	10.77
Building Eng.	291	37.8%	83.51%	6.92
Computer Eng.	101	12.8%	68.32%	6.59

After selecting the option for *Enquiry about persistence with one parameter* on the website ASIA[1a], we can access to the screen shown on Figure 5.

Figure 5. Screen to choose the Bachelor Degrees and check Retention Rates according to one variable.

Figure 6 is obtained, selecting the three degrees, the cohort 2012-13 and the *Academic Achievement* variable, and then accessing the option *Generating Chart.*

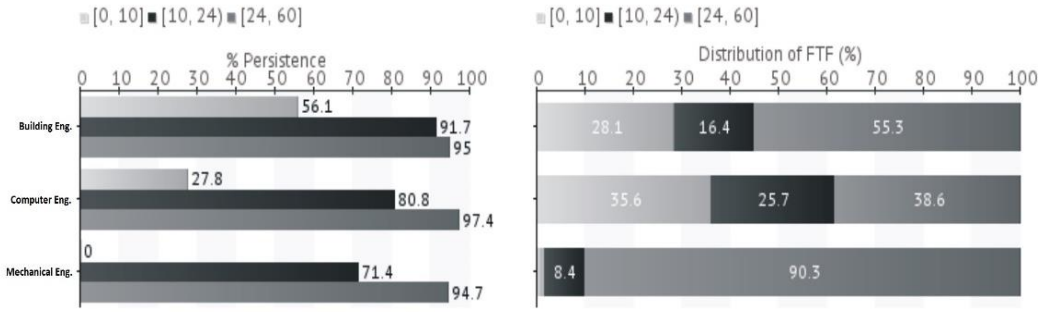

Figure 6. Persistence according to Academic Achievement (number of completed credits).

The students of each bachelor's degree appear distributed in three groups on the right according to their academic achievement, and on the left according to each group's retention rates. The percentages of students with an acceptable achievement differ considerably (90.3% for Mechanical Engineering Degree, 38.6% for Computer Engineering Degree and 55.3% for Building Engineering Degree). However, the retention rate for the FTF group with an acceptable academic achievement is similar for the three considered degrees (95%, 97.4% and 94.7%).

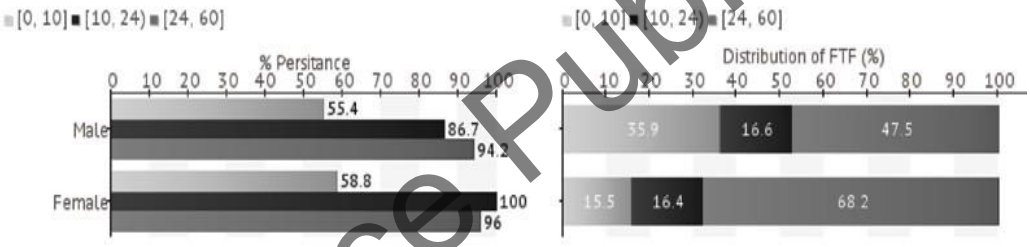

Figure 7. Gender and Academic Achievement in Building Engineering Degree.

Mechanical engineering students have the best access score average and very few of them fail (=completed less than 10 credits). Computer Engineering Degree counts with the lowest percentage of students with an acceptable academic achievement (38.6%), but the highest retention rate for this group (97.4%). Out of the three degrees, this is also the one presenting the highest percentage of failure, and its retention rate is very low among the students who fail (27.8%). Furthermore, this degree presents the worst average of access score and the lowest percentage of women. Tolerance towards failure is higher between building engineering students, since more than half of those who fail remain in the same program. Building Engineering Degree counts on the highest percentage of women compared to the other two degrees (37.8% versus 12.8% and 14.4%) and, making the cross search about *Gender and Academic Achievement* (Figure 7), we can appreciate that in Building Engineering Degree women show better academic achievement (68.2% of them show acceptable achievement) and the best retention rates (in either the group of acceptable achievement, the group of low achievement and the group of failure). However, the percentage of men showing failure in academic achievement in Building Engineering Degree is quite similar to that in Computer Engineering Degree. It could be that in Building

Engineering Degree the results are better due to its higher percentage of women, and therefore another research could be conducted.

Example of Use 2: Longitudinal Study. Evolution over Three Years

The application ASIA[1a] has also been used to carry out a comparative study of the years 2010-11, 2011-12 and 2012-13 at UPM (see GIEMATIC 2014). Some of the results are presented here below:

Table 4. Persistence and Dropout People for each cohort

	FTF	Persistence	Dropout Bachelor	Dropout UPM
2010-2011	4953	4243 (85.67%)	710 (14.34%)	571 (11.53%)
2011-2012	5077	4232 (83.35%)	845 (16.64%)	647 (12.74%)
2012-2013	4833	4255 (88.04%)	578 (13.58%)	433 (8.96%)

The global results (Table 4) show that the lowest retention rate corresponds to the cohort 2011-12. This cohort also counts with the highest number of Transferred People. This fact can be explained by the considerable increase of tuition fees over the year 2012-13, since the student who has to retake subjects have to pay very expensive fees. At UPM there are a lot of similar degree programs, and if a student changes to a different degree program, the already completed subjects will be validated. The students are allowed to take as first registration the subjects that they have not previously passed. By doing this, they avoid the payment –higher fees– of a second inscription for the subjects not completed in their first year. We can also see that the number of FTF has lowered by 5% in the academic year 2012-2013, which could be explained by the financial cuts, due to the crisis, with regard to the Scholarships Policy. Despite the difference in the number of FTF each year, the number of students who remain at UPM after the first year of university experience is similar for the three analysed cohorts.

Concerning the gender, the percentage of women among the FTF for the UPM over these three years has remained practically constant around 30%. The group of women shows a higher retention rate, as shown by Figure 8. Nonetheless, the evolution is similar between men and women.

As previously mentioned, the most influential variables on the retention rate are *Access Score* and *Academic Achievement*. According to the data from the Spanish Department of Education, Culture and Sports, 20% of the students who enter the university system with a score lower than 5.5 (the minimum is 5 points) abandons the degree after the first year, and the average of the number of completed credits in the first year of TEA degree programs is 31.8 (MECD 2014, 69-70). Figure 9 shows the average access scores, average of completed credits and retention rates for the three analysed cohorts of FTF at UPM.

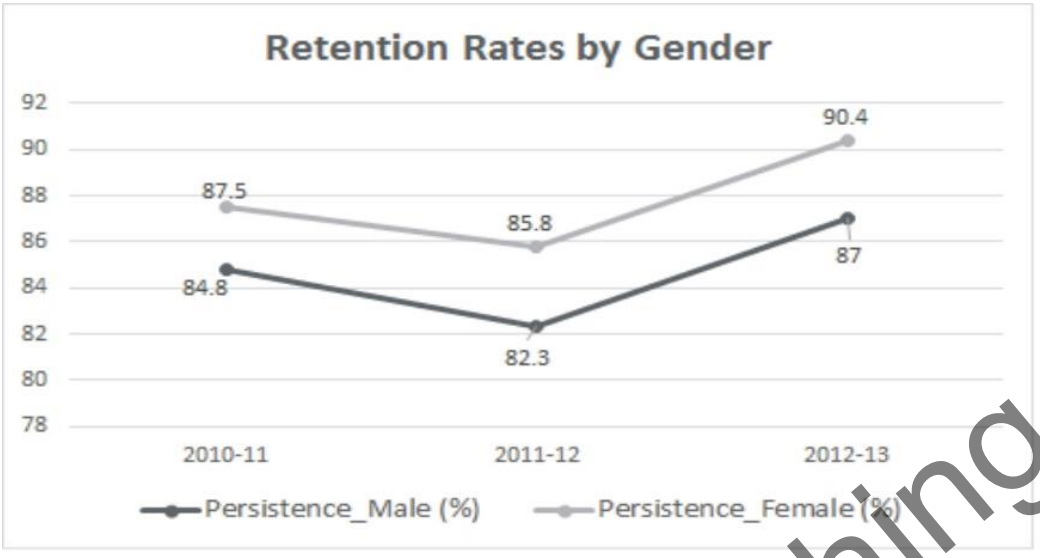

Figure 8. Evolution of the First Year Retention Rates by Gender.

Figure 9. Evolution of Academic Achievement, Retention rates and Access Scores at UPM.

The evolution of the average of completed credits and retention rates is quite similar. However, the average of access scores evolution is different. It can be stated that the retention rate is more related to the distribution of the population according to their access score than to the average of such access scores (see Figure 10).

In the academic year 2012-13, an increase in the proportion of students with an access score higher than 9 can be observed, and the biggest increase of the retention rate takes place in this group.

In addition, the analysis of the data in the different degrees shows that the degrees with the higher percentages of FTF, with acceptable academic achievement and better retention rates are those presenting the higher access score. This fact seems logical since it involves high level students, who find easy their academic integration. A positive evolution in the retention rates has also been confirmed in those degrees where welcome and integration actions have been implemented as well as plans of academic advising, advising between peers, levelling or placement courses, informative seminars at the beginning of the course, coaching workshops, etc.

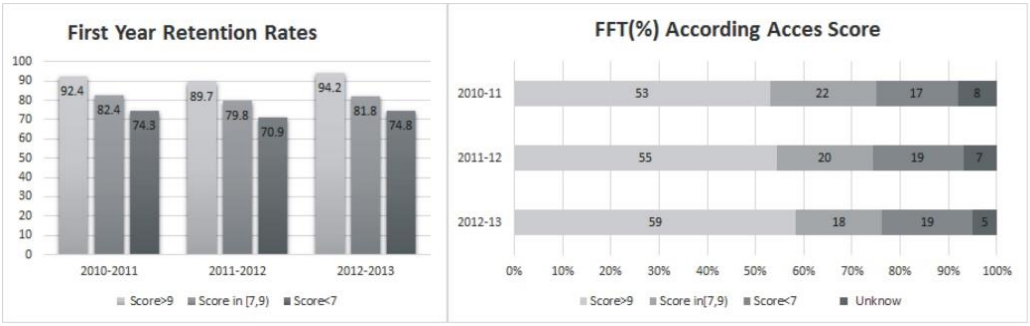

Figure 10. Evolution of Retention Rates according to Access Score.

CONCLUSION

Finally, as a way of conclusion, this chapter offers some ideas and lines of action which could be relevant to reduce academic dropout and increase retention rates.

- The First Year Retention Rate is a significant quality indicator that allows measuring the success of the actions implemented by the institutions to improve the retention of new access students.
- The software tool ASIA[1a] is simple, intuitive, sustainable and accessible for all the university community since reports can be automatically generated without external agents. It presents other advantages: it works on the total group of each cohort of students and not just with one sample; besides, longitudinal and cross-cutting studies are easily conducted; the influence of different factors can be analysed and the impact of the actions implemented to improve academic persistence can be measured. On the other hand, its current services can be expanded including data mining utilities, and only a reduced maintenance team and a yearly amount of input are necessary to keep the tool updated.
- In addition, ASIA[1a] is easily adaptable to other universities. This advantage facilitates it to be disseminated. In fact, there is already working a copy of this tool at the University of Oviedo, which is being used to perform some research about dropout and retention at this university (see Bernardo, Esteban, García and Rodríguez-Muñiz 2016).
- In order to increase the retention rate, the university must improve the process of data collecting when first contacting the students, especially in terms of the information that can be relevant to identify situations of dropout risk.

Other actions of interest are:

- To improve the student information and advising services about the degrees' contents, demands, professional options, etc.
- To strengthen the online teaching support, in order to increase the student's entry level of knowledge in the most difficult courses as physics and mathematics. Simultaneously, recognition has to be granted to professors for such a task.

- To improve and expand the plans of academic advising, creating qualified teams that collaborate on activities of integration and support for new students.
- To count with flexible inscription requirements in the case of students whose work situation is incompatible in terms of timetable, or who may count on other conditioning circumstances. Specifically, to reduce the minimum number of required credits to register for every academic year.
- Finally, as a key to improve retention rates at the university, the diffusion of the "Guide to good teaching practices" is considered a positive action.

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Chapter 15

POVERTY, INEQUITY AND EDUCATION: CORRELATION AND PROSPECTS

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ABSTRACT

The governmental discourse maintained that education is the main manner of social development. The school tries to build a society with principles of equity, plurality and democracy. However, social conditions hinder the educability of persons. The Mexican State, faced with this situation, has responded with the design of public policies with inclusive approach whose purpose is to align the conditions for the development of people; the purpose is the free exercise of social rights, a historic debt of the government with the people of Mexico.

Keywords: education, inequity, poverty, democracy, educational policy, public policies

INTRODUCTION

Education is an indispensable tool for the development and strengthening of societies just, equitable and inclusive. That, in a variety of circumstances, has been marginalized in the formal education system lacks some of the basic skills for successful social integration; the previous statement is a central hypothesis for the study, discussion and analysis of the causes and effects of the high levels of inequality that exist in Mexico.

Education has become a fundamental requirement for the development framework of the country that seeks to control and eradicate a serious social phenomena that potentially harmful to life in a democracy. Democracy can be understood as "a set of institutions and mechanisms that will ensure to each individual the possibility to make their interests" (Sartori

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2008, 94). The school is, from the political discourse, a means of transforming social conditions. "From the decade of the nineties, the social agenda in Latin America is strengthened with the criterion of education as a mechanism of impact for growth" (López 2007, 19).

However, the social complexity that is experiencing the nation submits the educational system to scenarios that do not guarantee basic conditions for the educability of persons. The process of teaching and learning is directly affected by the social conditions that exist in the environment. "Each time is made more visible the limitations of the educational systems compared to scenarios so devastated, in that their students do not have minimum conditions that allow them to participate in the educational process. Thus appears the need to emphasize that there is a need for a minimum level of well-being in order to be able to educate" (Tedesco 2002, 7).

In this scenario, the Mexican State has proposed, at least at the level of the discourse, the creation of public policies with principles of social inclusion of face to the construction of a democratic community. The equity is a historical debt of the federal government with the Mexicans that have historically experienced the substantial growth in the social divide. "Inequality is also persistent; in its modern mode; the high level of inequality originates in the exclusionary institutions that have prevailed since the colonial times" (De Ferranti et al. 2004, 1).

One of the recommendations of the Mexican government for the reduction of this gap is to level the access where people have a quality education, due to the range of influence that it has on the social mobility and access to new economic opportunities. "Quality education is the most important political, social, economic and cultural development in Mexico. It is the manner to achieve a respectful and harmonious coexistence, in a democratic society, just, peaceful, productive and prosperous" (Federal Government 2013).

But how do you ensure a quality education? What are the conditions that make possible the successful schooling of persons? It is here where the concept of educability takes on another dimension. Educability "aims to identify which is the set of resources, skills or predispositions that make it possible for a child or adolescent to successfully support school, at the same time that invites to analyze what are the social conditions that make it possible for all children and adolescents to access these resources" (Lopez and Tedesco 2002, 7).

The objective of this essay is to deepen on the relationship that exists between poverty, education, equity and inclusion as well as to identify what are the conditions that hinder the educability of persons in Mexico. The purpose is to set up a debate on the way that should follow the public policies in the country to guarantee citizens suitable social conditions that favor and reinforce the educational act. The intention is to create margins for the analysis of a phenomenon amply reported but little studied in the national context.

In theory a quality education is an inclusive education that aims to promote the participation of all without distinction of ethnicity, language, economic status, color or capacity. The challenge of the Mexican State is to make the school a place for all where awareness practices prevail, respect and appreciation of differences in cultural, social, economic and political, that it says, democratizing the education system through the democratization of the context.

CONFUSION ABOUT TEMPORALITY: DOES EDUCATE FOR SOCIAL EQUITY? OR DOES SOCIAL EQUITY IN ORDER TO BE ABLE TO EDUCATE?

While the social conditions are unfavorable and harmful educability of persons will be limited. The school is unable to build a paradigm shift that suppose the adoption of criteria of equity, democracy and integration as the basis of a new social dynamics. The State arbitrarily ignored that formal education[1] plays the symptoms of a social structure ill.

The school is neither the instrument nor the cause of the division of the society into classes, but rather its consequence, since the division of society into antagonistic classes is previous to the school. This means that the fundamental problem of the school is outside the school and precisely in the fight that faced with the bourgeoisie and the proletariat in the relations of production, which are relations of exploitation (Palacios 1999, 478).

The idea of the school, which is the way to construction a more advanced society is not new, It is as old as the school itself and It is legitimized through a series of instruments at the service of the state and the business class as the media, culture, the family, religion, the trade unions, the political system and the legal system. These instruments, called ideological apparatuses, the State (IAS) by the French Louis Althusser (1974), have the intention to play an ideal of citizen with an unified conception of the world.

Some theorists of educational liberalism insist on the assumption that education can by itself favorably influence the constitution of a democratic society. As resistance to this position the most radical writers take the concepts of theorists of reproduction (Bourdieu, Gramsci, Althusser, etc.) and of the theorists of critical pedagogy (Freire, Mclaren, Giroux, etc.) thus generating a new field of study and debate within the social sciences.

Contrary to the claims of the theorists and historians liberals that public education offers opportunities for individual development, social mobility and political and economic power to the unprotected and dispossessed, the radical educators have insisted that the primary functions of the school are: the reproduction of the dominant ideology, their forms of knowledge and the distribution of the necessary skills for the reproduction of the social division of labor (Giroux 1985, 36).

This trend toward the schooling is driven openly from international financial institutions such as the World Bank (WB), the International Monetary Fund (IMF) or the Inter-American Development Bank (IDB) in addition to multilateral cooperation institutions such as the Economic Commission for Latin America and the Caribbean (ECLAC), the Organization of the United Nations Educational, Scientific and Cultural Organization (UNESCO) The Organization of American States (OAS) and the Organization for Economic Cooperation and Development (OECD).

A more egalitarian education has the potential for multiple influences in terms of results and practices more equitable. Additionally, it has two important advantages as a strategy: it may improve its distribution without the need to redistribute and deprive another person, and improvements in the distribution (linked closely to the increases in the average levels of general education) are positive for the efficiency and growth (De Ferranti et al. 2004, 10).

[1] Formal education is the mode of teaching that is regulated by the State.

However, the Mexican education system has had to deal whit a historically profound unequal context. The institutions of the state have systematically reproduced actions of marginalization of social classes in situation of vulnerability. The new scenarios demand a State with public policies whit inclusive vision. Is evident the progress in the area of educational expansion through the coverage and access to the classrooms of virtually all the people that attend primary school, but is not enough. [2]

In Mexico this discussion is a priority because social inequity is the main problem of the national educational system. The context is not conducive to the equal access of persons to basic services, including education. And this condition is multiplied with persons belonging to any group in situation of vulnerability, mainly indigenous persons; those who have historically been marginalized in historical terms, cultural, political and economic. "It is the sector of the country where poverty is most acute and educational levels, the lowest" (Ordaz 2009, 9).

The educational politics in Mexico suffer from serious conceptual inaccuracies since it is estimated that the term equity refers to the level of coverage or the number of schools that exist in the country. This quantitative overview prevents knowing the coexisting relationships between equity and education, it means their causes and their effects strategies that tackle the problem are insufficient and have very little relevance by not addressing the roots of the same.

The Organization for Economic Co-operation and Development (OECD) said that the level of education of people, i.e., their years of schooling, can infer the economic development level and the quality life that these will have in a future "education plays a fundamental role that determines how they live in adulthood if they have a higher level of education it means that will have higher incomes, better health and a longer life" (OECD, 2007).

This assertion, which might seem reckless, retains the storyline of the educational policies of the Mexican State and the recommendations of the international financial agencies; however, the central problem is democratizing the context.

INCIDENCE OF SOCIAL CONTEXT IN THE EDUCATIONAL PROCESS

Some theoretical positions of the social constructivism of Lev S. Vygotsky (2015) say that knowledge is not formed only after a series of biological stages as suggested by J. Piaget (2001) or H. Maturana (2013), but that it is complemented through a link between the environment and the subject. That is to say, knowledge is created on the basis of the experiences that the subject has with his reality and the contrast that it makes with the experiences of other individuals. During the rubbing of the student with its context this internalizes, accommodates and transforms the previous knowledge in new knowledge leading to the emergence of new cognitive skills to allow it to face different situations in their reality. "Man is a being historical-social or, more specifically, a human being historic-cultural; the man is shaped by the culture that he himself creates" (Lucci 2006).

[2] In Mexico the basic education is configured through the pre-school education, primary education, secondary education and upper secondary education.

The stimulus coming from the context will be determinant for the development of new knowledge in the individual; an environment mostly stimulating will have a higher effect in the learning of the people. People establish new links and ideas thanks to previous experiences already consolidated; these experiences are the product of everything that is living in the household, with the family, in the neighborhood, with friends or in the school. This is where the human being is configured.

True education is rather a human process implicit in the everyday life of the social dynamics, in household tasks or in interaction with friends. Education is everything you learn and internalized inside or outside the school, education is a process innate in the human being is. The man is a consequence of a social and cultural context which allows it to be configured as a human being curious and creative (Garcia 2016, 861-862).

The individual is a social being by nature, so that cannot be conceived in isolation from the other, in that regard, his cognitive thinking and his subjective world can only be built on this relationship. However, what happens when the context has been disturbed and gives rise to a series of social pathologies? What is the impact of this phenomenon in the educability of people? In Mexico these pathologies have evolved damaging the social fabric; violence, crime, poverty or impunity are just some of the symptoms of a damaged structure and these symptoms respond to a greater evil; inequity or social inequality.

Inequality, therefore, is not expressed solely in the enormous diversity purchasing the income of people, but that derives from the discrimination of class, race, gender, geographical origin, of different physical ability, etc., which practiced of categorical manner (i.e., excluding all or almost all of the members of a group), then converted into a multidimensional phenomenon that make it incompatible with our democratic ideals (Insulza 2014, 15).

The school is a reflection of the social conditions and not the reverse. The social pathologies that experience the context, especially the Mexican context, will be reproduced in the classroom so that any attempt of social evolution that has as its center the school is doomed to failure.

The school is not an isolated entity, form part of a context with social characteristics, political, historical, cultural and economic factors that impinge directly on the construction of their practices and their relationships. The school must be understood and studied from the outside with a multidisciplinary and multifactorial which makes it possible to study its processes and its actors in an objective manner. Study about school from the school itself has created a wall that prevents knowing their real needs.

Today it is essential that social scientists in Mexico, especially those who belong to the educational area, raise the co-relation that exists between a context socially damaged and the effects that this has on the education of the people. The educational policies of Mexican state have raised in recent years[3] the need to strengthen the education with a specific criterion: the inclusion.

The most relevant documents as the sectoral program of education[4] or the National Development Plan, both the federal government, indicate the prevailing need to diversify the educational system to promote the participation of all individuals without distinction of any kind in the educational system. “This program puts special emphasis on generating situations

[3] Mainly from the arrival of Enrique Peña Nieto as President of the Republic in 2012.

[4] This program outlines the objectives, strategies and lines of action in the field of basic education, higher mean, superior training for work, sport and culture.

and build the contexts that allow access to the educational system of the population in conditions of vulnerability, especially of indigenous peoples and persons with disabilities" (Federal Government 2013).[5]

The purpose of this approach is to diversify the educational system and the learning contexts to give educational responses to all people. The challenge is to make the school a place for all where prevail practices of awareness and respect for differences in cultural, social, economic and political. The inclusion of "means that the educational centers undertake to perform a critical analysis of what can be done to improve the learning and the participation of all the students in the school and in their locality" (Boot and Ainscow 2000 21).

This educational approach emphasizes the presence of conditions around a safe community, welcoming and stimulating where prevail in a series of values that promote a healthy coexistence between people. But what happens when you contrast the postulates of the speech with the reality? Have the Mexican context, in social terms, what is needed for the implementation of the approach of inclusive education?

SCENARIOS OF EDUCABILITY IN MEXICO: CHALLENGES AND PROSPECTS

Mexico is in a certain sense an abstraction of the social conditions that exist in the Latin American region. Poverty and inequality are the central elements that hinder the educability of the people in the country so that these items will be the guiding thread of this paragraph. The data of 2014 on poverty in Mexico collected by the National Council for the evaluation of the Social Development Policy[6] (Coneval) show that in the country there are more than 55 million people who live in this situation which represents more than 40% of the total population of the country.

Even more worrisome is that 11.4 million people, which represents 9.5% of the population live in conditions of extreme poverty. Those people who live in rural communities or those belonging to any sector of indigenous people are the most vulnerable in terms of social, political and economic rights. "The rural environment of Mexico is in the manifested the highest levels of inequality and where the situation of poverty is more acute" (Ordaz 2009, 15).

The figures on poverty in the country are alarming if we consider that almost half of the population in Mexico don't have with the basic resources to carry an adequate standard of living and have problems to access to basic services such as food, health, housing or education. What impact has the poverty in the Mexican education? The report "Reaching the unreached" published in 2010 the United Nations Organization for Education, Science and Culture (UNESCO by its acronym in English) notes that the inequality in the learning tends to be mostly accentuated in the low-income countries.

[5] The National Development Plan is, first, a working document which governs the programming and budgeting of the entire Federal Public Administration.

[6] The National Council of evaluation of the Social Development Policy (Coneval) is a decentralized public agency of the Federal Public Administration that is responsible for evaluating the social policy and measure the rates of poverty in Mexico.

According to the document there is a correlation between the affiliation to a social sector in situation of vulnerability and the low academic performance. UNESCO warns that millions of children are at risk that won't receive education as a result of the economic crisis facing the countries of Latin America. Poverty is a cause of social exclusion and promoter of adverse social conditions for the educability of persons. "Poverty is an evil in itself: those who suffer lack the essential for the exercise of the most minimum degree of autonomy and ability to carry out certain plans of life" (Dieterlen 2001, 14).

The decline in the economic gaps between the social sectors must be priority axis for the Mexican State in order to lay the foundations for the construction of an equitable society that generated by a result, equitable education. The Mexican State has the obligation "The high level of inequality has considerable costs: increases poverty levels and decreases the impact of economic development designed to reduce it. It is also likely to prejudice the aggregate economic growth, especially when associated with the lack of equity in the access to credit and education and social tensions" (De Ferranti et al. 2004, 1).

Poverty is growing, mainly, in the groups in situations of social vulnerability. In Mexico the case more representative is the indigenous persons; eight of every ten persons belonging to some ethnic groups do not have basic education, while the level of schooling of this sector of the population is barely 1.5 years.

Mexico is a country with a wide cultural mosaic, in spite of this, the indigenous peoples have had to live with their social rights shackled and in a precarious economic situation, it is in fact this sector of the population which historically represented a block of resistance against the arbitrary acts of the government apparatus, examples there are several; normal schools in rural areas, as the "Raúl Isidro Burgos" of Ayotzinapa, the Zapatista Army of National Liberation (ZANL), the Popular Revolutionary Army (PRA), the Guerrilla Movement of Lucio Cabañas and Genaro Vázquez, among others.

The figures showing "Reaching the unreached" (see Table 1) should be understood as a trigger for the design and implementation of public policies that can shorten the social divide and level the economic conditions of the citizens, this would generate long-term decline in illiteracy rates, desertion or failure to attend school, thus promoting a more inclusive education based on principles of equity and democracy.

Table 1. Indicators of educational backwardness in Mexico

Indicator	Figure
Mexicans in educational backwardness	34 Million
Mexicans illiterate	7 Million
Children who do not attend school	1.4 Million
Mexicans with less than 4 years of study	1 million 324Thousand
Mexican student population in the level one of reading	40%
Indigenous people who do not have Basic Education	8 of each 10

Source: Own data. Based on the figures for Reaching the Unreached. UNESCO. 2010.

The aforementioned report urges the Mexican government, as was done in Jomtien[7] in 1990, Salamanca in 1994[8] and Dakar[9] in 2000, to multiply the resources to improve the conditions for the access and egress of children in basic education. "We must strive actively in modify inequalities in education and abolish all discrimination in the learning potential of the disadvantaged groups: the poor, the children of the street and working children populations in remote and rural areas, nomads and migrant workers, indigenous peoples, ethnic minorities, racial and linguistic minorities" (UNESCO, 1990).

However, Mexico has been unable to transform its educational system archaic in a tool that promotes equity and inclusion as form and philosophy of life. The causes are many but understood from the socioeconomic level of the people, the cultural capital and the characteristics of the primary context in which it operates. "Exclusion, inequality and social discrimination continue to operate, despite the school, in the interior of the school itself" (Lopez 2013, 273).

GOVERNMENTAL TRENDS TOWARD THE EDUCATIONAL EQUITY: PUBLIC POLICIES WITH INCLUSIVE APPROACH

In the face of the growing social divide in Mexico the state has proposed a series of public policies with inclusion criteria and democratization aimed to the approval of the conditions for the development of people. These policies respond to a compensatory criterion of governmental activity and affect all services regulated by the State, for example, education. Since their arrival at the federal administration in 2012, President Enrique Peña Nieto has promoted a series of structural reforms in order to modernize the education sector and compete on equal terms in the global market and the complainant in the knowledge society.

The first step was the design of the National Development Plan 2013-2018 (NDP); this document, a priority for the Mexican State sets a series of national targets which together have the purpose of promoting social development, improve the conditions for the development of the citizens and to establish guidelines for the construction of a more just and democratic context. One of these goals is that of *a Mexico Inclusive* that arises as a result of the high levels of inequality and social exclusion that exist in the Republic so that the Mexican State has designed a series of policies aimed at ensuring the free exercise of social rights.

The social development should be the priority of a *Mexico Inclusive*. Many Mexicans are facing a series of factors that keep them in vicious circles of development where the opportunities for progress are scarce. The 46.2 per cent of the population lives in conditions of poverty and 10.4% live in conditions of extreme poverty. The indicators also allow us to be complacent with respect to inequality of income, the violation of human rights, discrimination and limited access to health services and decent housing. The foregoing is not only

[7] From 5 to 9 March 1990 develops the World Conference on Education for All: Meeting Basic Learning Needs, which is being organized by the Unesco in the city of Jomtien, Thailand. The purpose was to establish strategies to ensure access to education and improve the quality of this.

[8] The World Education Forum was held from 26 to 28 April 2000 in the city of Dakar, Senegal.

[9] From 7 to 10 July 2000 is celebrated in Salamanca, Spain the World Conference on Special Needs Education: access and quality which is being organized by the Unesco.

unacceptable in terms of social justice, but also represents an important barrier to productivity and economic growth of the country (Federal Government 2013, 16).

The foregoing implies guaranteeing the right of Mexican citizens to have quality basic services such as food, decent housing, public safety, social security, drinking water, electricity or quality education. The federal government has a historical debt because these services are distributed even disproportionately and inequitable and are concentrated in a particular sector of the population; the term *inclusion* is not more than the legitimate right of the people to have equitable development conditions that will permit them to lead a dignified life, only thus will it be possible to lay the foundations of a truly plural and democratic society.

Another national goals that set the NDP is *a Mexico with quality education;* education is one of the primary axis of the federal government since it is believed that from schooling can level the conditions of life of the citizens and to reverse the growing trend of the social divide. This strategic line has as a priority the extension of educational coverage, the attention of the cultural diversity and the fight against illiteracy in the adult population. The criteria of inclusion and equity are established as joint shafts in favor of the construction of a democratic and open education system which allows access to all people regardless of gender, ethnicity, socio-economic status, disability, age or sexual orientation.

"The effort to raise the quality of education in all types and modalities should be accompanied by principles of equity and inclusion. The State should commit greater resources and efforts where most needed, understanding that the compensatory nature of public endeavor demand greater attention to the most vulnerable population. This program puts special emphasis on generating situations and build the contexts that allow access to the educational system of the population in conditions of vulnerability, especially of indigenous people with disabilities" (Federal Government 2013).

However, the efforts of the Mexican state have been partial and inadequate because there are still large indexes of lag that hinder the schooling of all people. The accession of the terms *inclusion* and *equity* to conceptual block of public policies must cross the barrier of the speech and established as a series of socially relevant and efficient strategies that help in the construction of a more just society, of a plural society and broadly based democratic.

The general idea of this line of action is to strengthen the legal framework and re-structuring part of the current regulations to encourage the criterion of social and educational inclusion in Mexican society; the main strategies are the increase in coverage, the strengthening of educational institutions to meet the social diversity, the increase in the number of scholarships to students of basic education, encourage inclusive practices-non-discriminatory practices in schools and promote the educational services for persons belonging to any group in situation of vulnerability as indigenous people or the disabled; in addition to reducing the rate of illiteracy and raise the efficiency ratio terminal of primary education.

To achieve the goals set in the PND, in regard to the lines *a Mexico inclusive* and *a Mexico with quality education,* the federal government has created the Sectoral Plan of education (PSE) 2013-2018; this policy takes up the criteria for inclusion and equity and establishes that the educational system should be the guarantor of the right of all persons to receive education without distinction as set forth in article 3 of the Political Constitution of the United Mexican States in its first paragraph and various international conventions in the

field as the Jomtien Declaration of 1990, the Salamanca Statement in 1994 and the Declaration Of Dakar in 2000.

The PSE vindicates the social relevance of having a quality educational industry to respond to the multiple global scenarios and raise the competitiveness indices and development. The vision of the new public policies put to education as a necessary condition for the development of political, social, economic and cultural life of the country, however, let us don't forget that in the name of progress are often committed the worst arbitrariness, mainly to those social groups that have a profound historical lag slopes.

CONCLUSION

The governmental discourse placed on education as a necessary condition and non-negotiable to boost the development and delegated to the school the ominous work of structuring a society with a democratic basis. Within the collective imaginary school is a benevolent institution and morally necessary and still have the idea that schooling for persons will provide a promising future mainly in economic terms since it will develop specific skills to cope with the demands of a globalized world and its labor market.

The widespread idea is that in the school was built the parameters for a life in democracy and sets the guidelines for a fair and inclusive social dynamics; this position is in stark contrast with the principles and assumptions of reproduction theorists who pointed out in general that the school is a tool of the state that accentuates and reproduces the inequitable social conditions that come from the context.

The school is not isolated from the rest of society is rather a reflection of her; for the educational act to be effective you have to establish criteria of equity in the context to level the development conditions of the people. The governmental vision that puts education as the basis of a democratic and equitable society has to be discussed with other which in contradiction to point that without democracy and equity the educational act is completely useless.

It is necessary to extend the debate on the correlation between inequality and education to establish systems of education with relevant social demands and sufficiently distant from the standardized and unified recommendations emanating from international financial agencies. The education will be a track for development always and when first reduce the gap of social inequality that exists between the Mexicans, otherwise the school will remain a tool of reproduction and not of transformation.

The answer is in the transformation of the context so that before educational policies requires social policies capable of integrating a community with social cohesion and substantive equality, this implies the realization of the right of all persons to have access to basic services such as food, decent housing, public security, education, etc., and Mexicans have a dignified and socially useful work to meet the daily needs.

Poverty is a ballast that undermines the education appliance, so that any attempt to set up a democratic school must pass necessarily by the approval of the conditions for the development of all individuals. There is a co-relationship between poverty and educational people marginalization of educational apparatus for two fundamental reasons: such as who are in this situation of social vulnerability are more difficulties than the average number of

people to access and completion of basic education, in addition to their achievement levels tend to be the lowest.

Social inequality is the main consequence of the unequal distribution of resources in Mexico. It is understandable to have an educational system little democratic when more than 40% of the population of the country is poor. This group, ironically, is the most punished in regard to the payment of taxs and in regard to the granting of government basic services in proportion to other social sectors, so that we are facing another ballast that undermines the educability of persons: the injustice.

The response of the Mexican State in the face of such scenarios is the design of public policies with inclusive approach in order to promote social development and level the living conditions of the people. The inclusion is not more than the legitimate authority that individuals have to exercise fully their social rights and count with a style of living. However, these government policies use of rhetorical form the concept of inclusion; it seems more an attempt of marketing with the purpose of promoting structural reforms that the Mexican State has implemented since 2013 and which have caused controversy in a broad sector of the population.

It is important to mention that do not deny the importance of institutionalized education however it is necessary to explore other complementary alternatives to establish the foundations of a democratic society; Mexican public policies operate under a technocratic approach and quantitative results, ignoring in the name of progress and social development, the variety of knowledge that can enrich substantially the educational system. Diversity is part of being democratic; plurality is formative and allows you to develop a broader vision on other scenarios and other ways of interpreting the world. Buried under the pretext of development and social evolution is to deny the roots of a country with one of the largest cultural diversities in the world.

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Chapter 16

BEATING THE ODDS IN UNIVERSITY, LABOR MARKET AND LIFE: THE ROLE OF HIGHER EDUCATION IN TIMES OF SOCIOECONOMIC CHANGE

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ABSTRACT

This chapter addresses the role of Higher Education in times of change, taking into account three of the key-issues for the EU 2020 growth strategy: employment, education, and social inclusion. The concept of empowerment is discussed as a way to accomplish such targets, here analyzed according to three main components: educating for the labor market - focused on individual development and social empowerment, as a way to reach the so-called 21st century skills, and to promote employability; educating for individual agency - as a means for further social inclusion and general enrichment of citizenship; educating for career management - which is especially relevant in a time when lifelong learning is presented as an essential factor to remain competitive in the world work. Moreover, we present innovative changes to be implemented in Higher Education, as an interesting way to bridge the gap between the worlds of Education and work. A review of good practices is presented, as a way to improve knowledge, skills, and attitudes, while simultaneously empowering students to be lifelong, critically, reflexive learners, who are socially responsible and committed.

Keywords: higher education, empowerment, labor market, individual agency, career management

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INTRODUCTION

The fields of education, employability, and social inclusion have been recognized as key-drivers within the Europe Union (EU) 2020 Strategy to overcome the socioeconomic crisis, to boost growth and jobs, and to foster social equity. The OECD 2013 report indicates that individuals holding a below upper secondary education are 50% more likely to suffer from obesity, and 84% more likely to smoke, when compared to individuals holding a college education. Such example illustrates how people with a higher level of education may be less prone to incur in inadequate or even "risky" behaviors on a daily basis.

Policy makers have realized the importance of investing in Education and training through individual development, as a way to promote economic growth (Allen and van der Velden 2011; García-Aracil and van der Velden 2008; Hartog 1992). The OECD claims that individuals are now being strongly encouraged to pursue further education. Also, governments have access to incentives to build on population's skills through Education (2013). The numbers presented by the OECD 2013 report concerning employment rates accomplished by different educational levels demonstrate this emphasis on Education and training. These rates highlight the value of a Higher Education (HE) diploma, perceived as a gateway to better labor opportunities and income premiums. Accordingly, over the past 15 years, employment rates in the OECD countries have been consistently higher for people with a tertiary education level. Currently, unemployment rates in these countries are nearly three times higher among individuals who do not have an upper secondary education (about 13%), when compared to those who have a tertiary education (about 5%). As for employment rates, over 80% of the individuals who are employed hold a tertiary education, and over 70% completed a secondary education (OECD 2013).

The Bologna declaration and subsequent initiatives have placed HE in the center of EU policy, with the goal of creating what was defined in the Lisbon European Council, in March 2000, as "Europe of knowledge." The establishment of the European Higher Education Area (EHEA), in 2010, which followed the Bologna Process, launched in 1999, has largely contributed to reinforce the focus on the promotion of graduates' employability, but also, on lifelong learning. HE institutions are faced with the challenge to prepare students with skills that are permanently needed, whether it is to make decisions concerning academia or work, whether it is to think about everyday matters (concerning, for instance, personal, interpersonal, social, or political challenges). Such development encloses a holistic perspective, going beyond the theoretical and technical knowledge offered by a college education. As stated by Knight and Yorke (2002), besides preparing graduates to assume future employment-related roles, HE "has an acknowledged role in lifelong learning in educating further the middle manager so that he or she can manage more effectively; in up skilling the teacher or process worker; facilitating the development of active citizenship; and so on" (p. 262).

In face of this framework, the question to be asked is which changes are required in HE in order to achieve the EU 2020 targets of Education, social inclusion, and employment. Focusing on the concept of empowerment as a way to accomplish such targets, three main components are proposed and developed throughout this chapter: educating for the labor market (LM), educating for individual agency, and educating for career management. On the grounds of the revision of current literature, this proposal intends to be a contribution to the

field of HE, in articulation with current European strategies. A relevant effort is made to reconcile distinct frameworks, in an attempt to address some of the key-issues for the EU 2020 growth strategy. Moreover, an integrated and practical proposal, which is theoretically supported, is presented. Lastly, we propose innovative changes in HE, as an interesting way to bridge the gap between the worlds of Education and work.

EMPOWERMENT: THREE PROPOSALS TO REACH THE EU 2020 THREE KEY-TARGETS

Employability emerges as an urgent priority for Europe, one to be integrated with two other priority topics: education and social inclusion. This entails the need to educate individuals for the LM, making them able to update and adapt to the so-called 21st century skills, in order to promote employability. This represents the first proposal, focused on individual development and social empowerment. A second strategy that is proposed is the importance of educating for individual agency as a means for further social inclusion and general enrichment of citizenship. In times of cultural diversity and increasing internationalization, HE must move "beyond literacy and numeracy, to focus on (…) new learning approaches for greater justice, social equity, global solidarity, cultural literacy, and sustainable development" (UNESCO 2015:3). The third proposal concerns the importance of educating for career management. This is especially relevant in a time when the European Commission is supporting policy development through the Lifelong Learning Programme, in order to make individuals competitive in a diverse training market (Bridgstock 2009). All three topics that are proposed, which are driven by the EU 2020 key-targets of education, social inclusion, and employment, share a common core - empowerment -, which is described ahead in more detail, based on a review of different theoretical frameworks.

Educating for the Labor Market

There are three major trends, proposed by Allen and van der Velden (2011), that affect the demands faced by HE graduates in the LM transition: (i) the increasing emphasis on Education and training; (ii) the changes in LM processes, and in the transition from Education to work; and (iii) the internationalisation and globalisation of product markets and LM, as well as their impact on HE. According to the same authors, such trends give rise to a new set of competencies that individuals should develop, which are organized according to five demands of the LM. The first is *professional expertise*, which implies a high degree of relevant knowledge and skills in one's domain of work, as well as analytical thinking, and decision making and problem solving ability. The second is *functional flexibility*, related to the ability to adapt to changes in the (work) environment, but also, to deal with changes in a positive way. The third, *innovation and knowledge management*, refers to aspects such as creativity, curiosity, and willingness, as well as to the ability to question, to access new ideas that were developed in other contexts, and to synthesize information from different sources, as well as to implement ideas. The fourth, *mobilization of human resources*, whether personal or of others, aims to accomplish an optimal use of the human resources that are available. The

fifth and last demand is *international orientation*, i.e., the need to develop intercultural competencies, such as the domain of foreign languages, or the ability to understand and empathise with other cultures, and to understand the limitations of national contexts.

This set of demands is presented as a general and useful guideline to drive educational practices. Current employability models are sufficiently broad and complex, going far beyond specific or static skills. A common aspect of several models is that they presume the ability to apply skills in professional contexts, according to the specific demands of each situation; also, they place a strong emphasis on self-awareness, as well as on the professional context (Bennett, Dunne, and Carré 1999; Law and Watts 1977; Pool and Sewell 2007; Yorke and Knight 2004). Thus, the competencies that must be developed to face the new LM demands should aim at a multifaceted and multipurpose target, comprising both specific and transversal dimensions. In a professional scenario, where it is fundamental to have the ability to adapt, whether it is to the diversity of job activities, whether it is to the different companies or countries in which the majority shall undoubtedly be working in throughout their lifespan, it is indispensable to follow the path of continuous education/training. In this line, the core role of HE institutions should be to empower students, providing them the tools that are crucial for continuous improvement and adaptation, thus enabling them to *be(come) useful* in multiple domains, but also to *make use of* those multiple domains in the pursuit of their life goals. Accordingly, the ability to think for oneself and to take responsibility for one's own learning and actions lies at the centre of the OECD approach to the renewable set of skills and competences for the 21st century (Ananiadou and Claro 2009).

Educating for Individual Agency

While Education can enhance human capital and prepare individuals for the LM, people benefit from Education in ways that exceed this domain. Education also fosters individual well-being and freedom, improving economic production, mobilization of resources, and social change. Aligned with the EU 2020 strategy, HE is being challenged to provide a broader engagement – to provide economic, but also citizenship, environmental, social, and cultural development. In the recent *Rethinking Education* (European Comission 2012) strategy, HE is challenged to meet the challenges of a society constituted by difference and conflict, and to respond with actions and ideas that critically engage and encourage diversity.

In turn, Bathmaker et al. (2013) claim that universities must consciously maximize the college experience, which is done by actively providing students with the opportunities to achieve *more than just a degree*. In doing so, they will also be dealing with the equity challenges mentioned earlier. Likewise, Nussbaum (1997, 2002) stresses the important contribution that HE can make in educating for citizenship. According to her, Education should "liberate" the students' mind, encouraging them to take charge of their own thinking. In this perspective, the role of HE is not simply assigned to the preparation of future professionals, since it is also expected that HE will provide the opportunity of general enrichment and empowerment, and encourage the cultivation of reasonable, deliberative, and democratic citizenship. Critical thinking, independent judgment, and debate are considered fundamental tools to create significant and valid knowledge to all people, being part of a collective societal endeavor (Shephard and Dulgar 2015). HE institutions play a relevant role as "focal points for shaping critical thinkers, problem solvers and doers" (European

Commission 2013:13). Bathmaker, Ingram and Waller (2013) also refer to the importance of building personal capital for graduate employability, which goes beyond a degree and beyond the purpose of employability. This highlights the importance of activating individual capabilities and empowering individuals, especially amongst the most disadvantaged social classes. Here, *capabilities* are defined as what people are actually capable of be(com)ing and doing, rather than what resources they have access to. In other words, what is argued is that everyone should have the opportunity to make a free choice, reasoned and well-informed. And this presumes the core concept of *individual agency*, which describes an active approach, guided by personal values and goals, to create or precipitate change (Sen 1999; Walker 2005).

The idea of fostering individual agency is also grounded on the concept of *ethical learning*, presented by Boni and Lozano (2007). The authors returned to the principles enunciated in the *Magna Charta Universitatum*, in 1988, which guided the activities of universities: "give future generations Education and training that will teach them, and through them others, to respect the great harmonies of their natural environment and of life itself" (p. 1). HE is here assigned the mission of building a better understanding of the world, of each person's place in it, and of the contribution each individual can make. From this perspective emerges the concept of *ethical learning*, a model for moral education with the goal of creating a better world, in which productivity and innovation contribute for the development of personal autonomy and social justice (Boni and Lozano 2007). Three mains reasons ground the need to consider ethical learning in HE: the global and multidisciplinary nature of the challenges faced by today's society; the need for ethical learning in professional training (i.e., a good professional masters specific techniques and applies them wisely); and the current inevitability of working in a multicultural environment, in interdisciplinary projects of increasing complexity, which compel people to develop attitudes and foster values of cooperation with others, openness to dialogue, or independent thinking. In sum, another core idea that can be highlighted is the need to educate and prepare empowered citizens, who are committed to the general well-being (UNESCO 2015).

Educating for Career Management

Another important aspect concerning individual empowerment in the 21st century regards the ability to proactively navigate the world of work and to self-manage career (Bridgstock 2009). Career management skills play an essential role in current times, where individuals are expected "to become protagonists of their life project" (Arthur and Rouseau 1996). Career management skills are defined by Sultana (2012) as the whole range of competencies that help to create structured ways for individuals and groups to gather, analyse, synthesise, and organise self, educational, and occupational information, as well as the skills to make and implement decisions and transitions. These skills should be explicitly included in the policy debates concerning employability and generic skills, playing a prominent role in university programs (Bridgstock 2009). And yet, Watts (2005) claims that the development of career management skills remains mostly unaccomplished in universities, and that many graduates are underprepared to face current trends of shifting employment and training options, between which they must build a career (Bridgstock 2009). Several individual, educational, societal, and economic benefits have been implied, namely in terms of employability, productivity,

and education/work efficiencies (Bridgstock 2009; Gillie and Gillie 2003; Mayston 2002; Sultana 2012).

The concept of employability has more and more taken on a person-centred approach in the literature, which emphasizes the individual role determining one's own status in regard to employment (Fugate, Kinicki, and Ashforth 2004). In a socioeconomic context where the concept of career is no longer synonymous of security, stability, and vertical progression, the focus is now on the idiosyncratic contribution that an individual makes in building his/her own career (Coutinho, Dam, and Blustein 2008; McArdle et al. 2007). Hall (2004) refers to the *protean career*, which is directed by the individual and not by, or on behalf of, a particular organization. According to this perspective, each person should develop a sense of agency over her/his own career, making decisions according to personal interests and values, which should be the essential driving forces of career decisions.

In line with the idea of career management skills is the concept of *career adaptability* (Savickas 1997; Savickas and Porfeli 2012), which concerns the resources to cope with present and possible tasks, transitions, and traumas in one's occupational roles that, to a small or large degree, can alter social integration (Savickas 1997). This concept follows today's trendy and growing interest surrounding adult development, as well as the rapidly changing technological and economic spheres, which require the need to be prepared for life transitions. Also, it is compatible with the developmental perspective of career, which suggests that flexibility is needed as a response to the environment (Savickas 1997). This way, the development of adaptability has to be self-directed and guided by a personal sense of agency towards career. As Sultana (2012) suggests, it is crucial that all citizens are equipped with the discretionary knowledge that helps them to make sense of their working lives, and to have as much informed control over their lives as possible. People greatly vary in their self-awareness concerning personal goals, aspirations, motivations, traits of personality, soft skills, and resilience. Also, they are incredibly singular in regard to aspects such as the assessment they make about learning opportunities, their contextual understanding, or their networking ability, factors that support learning and development. Here, Education must be resourceful in stimulating individuals to make the most of their opportunities, and this is done by catalyzing skills related to critical analysis and reflection, anticipation and organization, as well as the ability to function in multiple settings, and to transfer knowledge and skills between them (Bimrose et al. 2011; Brown 2009). The central idea is to empower individuals to take ownership of their careers, which is accomplished by making positive decisions and constructive actions regarding the refinement of abilities (Bimrose et al. 2011).

IMPLICATIONS FOR HE: A REVIEW OF "GOOD PRACTICE" PROPOSALS

In this section, we present a practical proposal to integrate the three pathways to empowerment, which were previously discussed: educating for the LM, educating for individual agency, and educating for career management. Despite the apparent distinctiveness of the three components, the practical guidelines to promote each one seem to be transversal to all.

The question that emerges from the three proposals here described concerns which should be the priority skills and competencies driving curricular programs. As for the answer to this question, it shall obviously be aligned with the objectives of Education, and with society's priorities in the near future. The EU 2020 key-targets discussed in this paper - education, social inclusion, and employment - are considered important guidelines. This way, first, to tackle the goals of LM and individual agency, a set of curricular and pedagogical changes are analyzed. Then, to approach the third proposal, career management strategies are presented. All three were guided by a literature's review and are, also, aligned with the framework presented in this chapter.

Curricular and Pedagogical Changes

The proposal here presented is to foster individual empowerment, and to approach Education as a way to develop important key-technical and transversal skills for the professional demands of this century. Furthermore, we stress Education as a way to enhance the ability to question, to think critically, to be self-aware, to make and understand individual decisions, and to have influence in policy decisions - in other words, to develop a sense of active citizenship (UNESCO 2015). Such a proposal demands space in the curriculum, which, alongside vocational training, allows to address what Nussbaum (2002) calls "humanistic richness in the professional education." Itis aimed at replacing the curriculum that is solely oriented towards professional practice, and which neglects personal development and ethical learning. At this respect, the same author gives the example of two distinct dimensions: development of basic required courses that all students take (part of the "liberal education" or "general education" component of a US university education), and the infusion of world-citizenship perspectives in more advanced courses in the different disciplines. Besides these two alternatives, a third one, more flexible, is proposed: optional subjects related to citizenship or human development perspective across the different fields, allowing students to deliberately engage in such programs.

As examples of important values that can be promoted in a citizenship or human developmental perspective, Boni and Gasper's matrix (2012) can be useful. It includes topics such as well-being, participation and empowerment, equity, diversity, and sustainability, which can be integrated in teaching activities such as moral education, global issues (e.g., ethics, sustainable development, peace studies), with a cultural and multicultural presence in the curriculum.

Innovation in pedagogic methods has been generally proclaimed in order to respond to current societal and professional demands. Examples of some innovative practices in teaching and learning are Problem Based Learning (Kwan 2009; Savery 2006), the Project Led Education (Fernandes et al. 2014; Powell and Weenk 2003), and Cooperative or Peer Learning (Boud, Cohen, and Sampson 2014; Slavin 2012). These teaching and learning practices emphasize an orientation towards questioning, presenting challenges, and proposing projects or problems to solve, which stimulate a more active role and deep learning from students. This new learning philosophy is oriented towards the professional realities of future graduates, including the exposure to specific LM, political, or social problems, and this right from early training moments. This learning philosophy stimulates critical thinking and reflexive practices, and can relate curricular contents with reality, which are key-aspects for

human development in universities (Boni and Gasper 2012). It also provides an opportunity to work in contexts that are very similar to the professional ones, which implies the need to work under pressure, or in a team, and to apply transversal competencies such as interpersonal competencies or time management.

Nevertheless, some caution is recommended, since the efficacy of these methods depends on an appropriate implementation. According to Allen and van der Velden (2012), programs cannot neglect basic skills, core subject knowledge, and domain-specific skills. This highlights the need of structure to develop a body of knowledge in a given domain, because students need to see how new information fits within their existing frame of reference. The authors also consider that an excessive focus on innovative methods may easily obscure the fact that effective skills acquisition also requires practice, repetition, and routine.

Another important point concerns assessment of students. According to the *Synergies for Better Learning report* (OECD 2013b), assessment should balance both formative and summative assessment. At this respect, Knight and Yorke (2002) refer to the need to provide plenty of feedback in order to develop self-assessment and to lead to enhanced future performance. Self and Peer Assessment have been referred to as innovative methods that represent good practices (Boud 2013; Clegg and Bryan 2006; Topping 2009), and are frequently used together with the teaching and learning methods cited previously. Clegg and Bryan (2006) describe several practical experiences, demonstrating that students who practice self and peer assessment become engaged with the process of making judgements, and learn to understand how quality work is defined. Nevertheless, the reflection about assessment should also focus on the needs to be assessed and how. As Allen and van der Velden (2012) propose, it is important to align the way we assess students with the goals of the curriculum. Current assessment methods leave out important aspects, such as students' ability to transfer knowledge to real world situations, teamwork capabilities, or the ability to effectively use different forms of mediated interaction (Dede 2010).

In 2008, Silva published a report about the assessment of skills in the 21st century, describing good practices in that subject. One example of good practices is the College and Work Readiness Assessment, which measures how students perform on constructed response tasks that require an integrated set of critical thinking, analytic reasoning, problem solving, and written communication skills. The Programme for International Student Assessment, commonly known as PISA, is the second example, and this one is focused on the preparation of adolescents to meet the challenges of today's society of knowledge. The assessment focuses on young people's ability to use knowledge and skills to meet real-life challenges, going beyond the ability of simply reproducing information. The third example provided by Silva (2008) is the "Key Stage 3," which assesses the ICT literacy of adolescents in Great Britain. This test assesses the ability to use ICT skills to solve a set of complex problems involving research, communication, information management, and presentation. These examples of good practices stress the importance given by current assessment trends not just to skills per se, but mostly to circumstances and real-world daily situations and challenges, already discussed in this chapter.

Career Management Practices

Currently, several frameworks can be used to approach career management programs. One example is the Canadian Blueprint for Life/Work Designs, aimed at three basic goals: (i) personal management (exploring and developing self to respond and adapt to life and work changes); (ii) exploring learning (exploring, understanding, using and evaluating life/work information and needs); and (iii) "work" and "life/work building" (developing abilities to create work opportunities, and to manage one's career along with life roles). These goals converge to the development of generic reflexive aptitudes that support individuals in understanding self-in-context, in making decisions regarding Education, training, and work pathways, and also, in fostering self-efficacy (Sultana 2012). This same author also presents different proposals about the way in which such competencies can be developed in the curriculum: as a separate subject; as a compulsory theme across the curriculum; with extra-curricular activities; or as a mix of two or all three. In any of the methods proposed, the main challenges seem to be related to the possibility of deepening the contents in a way that allows students to integrate career development learning with their own subjects. At this respect, the privileged methods seem to be those that are applied and that depend of reflective processes, such as role-plays, self-audits, problem-based group work, work-integrated learning, and peer review (Bridgstock 2009; Watts 2006). Moreover, Bridgstock (2009) stresses that a "one-size-fits-all" model of implementation of career management skills cannot be satisfactory. Also, it is necessary to involve academic staff, industry partners, career service staff, and students in both curriculum design and implementation, in order to create programs that are relevant and effective.

CONCLUSION

This chapter aims to reconcile distinct frameworks in order to address some of the key-issues for EU 2020 growth strategy: employment, education, and social inclusion. This is done using an integrated and practical proposal, which is theoretically supported. Through Education focused on the needs of the LM, individual agency, and career management skills, individuals can become (more) empowered. Thus, the proposal we present aims for individuals who are willing to be informed and who are aware of their (and others) rights and duties, as committed, participant citizens. In other words, individuals who are socially responsible and who are more likely to promote social inclusion of others. Moreover, social inclusion may also be fostered via employment, seeing that it is related to a higher economic status, to access to basic health care, or even to (more) opportunities of social empowerment.

Education and, specially, HE have to go hand in hand with social and economic issues. Likewise, research interests must integrate these different key-topics in order to respond to social challenges. In the present chapter, the role of HE is discussed according to a perspective that goes beyond the traditional debate around marketisation versus academisation (Ek, Ideland, Jönsson, and Malmberg 2013). Economic growth and employability development can and should be in tune with individual and social concerns, and here, education institutions have a crucial responsibility in such interconnection. In light of a wider approach of HE, its goal should be not only to foster the development of technical

and general skills that meet the LM requirements, but also to promote the necessary skills for individuals to (be)come active participants in their own lives, as well as in the global community they live in.

Hence, HE institutions must stimulate empowerment in a magnified sense, so individuals may become authors of their academic learning, professional performance, career development, and everyday lives. Even if HE institutions cannot promise to handout specific skills that shall assure students a job for life, or even a temporary one, they may guarantee that students will acquire valuable and varied resources, which will strengthen their ability to permanently adapt to the different experiences they will undergo throughout their careers and lives. To this regard, Harvey (2000) claims that HE should essentially be responsive to what he calls "new realities" (i.e., a rapidly changing world), where graduates must be lifelong learners. Thus, the primary role of HE should be to transform students, which is done by improving their knowledge, skills, and attitudes, while simultaneously empowering them as lifelong, critically reflexive learners who are socially responsible and committed.

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Chapter 17

RESEARCH IN EDUCATION: GOOD PRACTICES

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ABSTRACT

The promotion of excellent education with the intention of improving students' results –and consequently their competitiveness– is a permanent objective of the social policy implemented in developed countries. The only way to know how we can improve the quality of education and the extent to which it depends on the efficiency of learning in the classroom, and to turn this knowledge into social policy, is through high quality scientific research, both basic and applied. In order for research in education –which is usually carried out within natural environments– to be rigorous, it must necessarily satisfy a fundamental threat: that of selection bias. Selection bias is a complex problem mainly caused by the inability to assign the units of analysis to the experimental groups at random. Consideration of the complexity of selection bias involves using extreme caution in the method and also in the data analysis. In this chapter, we explain how selection bias should be addressed in planning research based on careful design, both with regard to the intervention and the control of confounding variables, on the one hand, and in the data analysis, on the other.

Keywords: evidence-based (practice-treatment-policy), treatment integrity, control, selection bias, effect of third variables

INTRODUCTION

The *British Medical Journal* has considered the concept of *Evidence-based Practice* to be one of the 15 most important milestones in the history of medicine (Godlee 2007). And not

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without reason. The *Evidence-Based* phenomenon is a driving force for scientific progress in general and for the development of method(s) and procedure(s) in particular, enabling us to obtain knowledge with maximum excellence and to transform it into a useful tool in order to solve real problems as effectively and efficiently as possible. The term originated in the medical field, and first became known in 1995 when The Centre for Evidence-based Medicine (CEBM) was founded in Oxford. A year later a paper, published in the *British Medical Journal* and entitled "Evidence based medicine: what it is and what it isn't" (Sackett et al. 1996), describes the content of the term, which can be summarized in two precepts: one, that decision-making at a practical level must be based on the results of research studies that have taken extreme precaution in all of the steps involved in the process, and two, that the information contained in the results must reach all of the individuals and institutions interested in its application with the greatest possible transparency. Thereafter the term went viral, and today there is no branch of science or professional or policy decision that does not pride itself on including terms such as *Evidence-based Practice*, *Evidence-based Treatment*, *Evidence-based Policy*, *Research-based Evidence*, etc. and adapt them to its own particular sphere from a variety of angles.

This idea took root in the field of education in 2001 with the enactment in the United States of the law of general education funding, Public Law 107-110, the No Child Left Behind Act (NCLB). Its strength increased in 2004, when the law on special education funding was passed, Public law 108-446, the Individuals with Disabilities Education Act (IDEA). Through the first of these two acts, an appeal is made to all education professionals to make decisions solely based on the rigorous scientific knowledge obtained, when they need to intervene to solve a particular problem. The second of these two laws highlights the need to detect learning difficulties in their early stages and to intervene effectively, embracing the model of Response to Intervention (RtI) (Brown, Chidsey and Steege 2010). The RtI model involves three levels of action: the continuous assessment of all pupils to identify individuals with learning disabilities, intervention in small groups for students in need of support in order to improve their skills, and intensive individualized intervention for the most serious cases.

Obviously, the importance of education is superlative. The Organisation for Economic Co-operation and Development (OECD) recognizes that the welfare of a country (according to indicators such as economic and cultural development) depends on its human capital (with students' academic performance as an indicator) (Wahlberg 1990). This is why education is one of the OECD's main concerns. All governments without exception now have the common goal of connecting research, policy and practice to improve the educational results of all students, and thus, the economic and cultural growth of their countries.

At this point in the discussion, we can say that the evidence-based construct is the bridge between basic and applied research, and actual practice. In other words, it is the link between the efficacy, efficiency and effectiveness of a treatment that has been demonstrated empirically by one or more research methods (and certified and approved by meta-analysis) and the actual implementation to solve a specific problem, whether locally, as occurs with RtI, or on a large scale, as with the implementation of educational programs at government level.

The concept of scientific evidence is dense, plural and dynamic. It is dense because it involves being rigorous in the intervention or observation, in the control of everything that makes up the context of the research (whether in a controlled laboratory environment or a natural context), and in the control of the context that is adjacent to the research. Rigor is also

required in the evaluation and analysis of the data. It is plural because it embraces all research methodologies, from the most powerful ones for demonstrating the efficacy of an intervention, to those whose function is simply to support the search for possible hypotheses to test. But above all, it is *necessarily* plural because no single research methodology alone covers all of the possible needs. In addition to knowing the efficacy of a particular treatment, it is necessary to know its efficiency and effectiveness. This *necessarily* requires the help of different investigations based on various research methodologies, and the support of varied approaches to analyzing the data that provide different results, and all of these methodologies and approaches must be complementary (Ho, Peterson and Masoudi 2008). It is dynamic, because the greatest scientific evidence, provided by meta-analyses conducted with rigor, is always subject to review in light of results from new treatments or new analyses conducted with greater rigor or carried out with different or new procedures. The object of study may also be viewed from angles other than those covered so far and enriched by adding nuances.

In this chapter we cannot cover all the methodological issues relevant to the field of education, but we can cover a selection of four aspects that we consider of vital importance. Based on the fact that intervention and evaluation are two main areas of interest in education, we begin our exposition with the concept of treatment integrity. We continue with the characteristics of experimental research for demonstrating the efficacy of the intervention, which provide maximum value when obtaining scientific evidence, focusing on randomization and control. Finally we cover the biggest threats of inference (substantive and statistical), selection bias and the influence of third variables. The solution of these threats deserves two special sections, one for propensity scores, and another for the definition and detection of relationships of mediation, moderation, confounding and covariation.

TREATMENT INTEGRITY

Despite the enormous structural differences between experimental, quasi-experimental and single case designs, they all have one detail in common, for which they are considered (although some more than others) the most powerful designs for obtaining scientific evidence. This common detail is the controlled application of the treatment or the active intervention of the researcher (experimental manipulation). It is worth immersing oneself among the different philosophical views concerning what is necessary and sufficient in order to be able to draw a conclusion causally (see Pearl, Glymour and Jewell 1916). However, they all converge completely into one: when you know what the cause is, where it originates, and what it consists of, doubts about the supposed cause dissipate greatly.

Technically, manipulation involves systematically varying the values of the independent variable at the will of the researcher. The researcher decides what levels of the independent variable to introduce in the investigation, whether to select them in a fixed way or randomly, and what relationship those levels will have among each other (cross, or nested). None of these issues are trivial, among other reasons because they determine the nature of the hypotheses that will be tested, their inferential scope, and the construction of the formal statistical model to test the hypotheses (see Ato and Vallejo 2015). All of these technical or formal decisions concerning the treatment or intervention are necessary, but they are insufficient to channel their active ingredients to the subjects to whom the treatment is

addressed. Finally, someone (a researcher, teacher, or clinician, etc.) will apply the intervention to subjects hoping to achieve certain results. Without going into the specifics of this task, depending on the purpose of the research, basic or applied (intervention to solve a problem or to answer a research question), it may involve anything from the application of a standard protocol to the creation of a customized protocol. This is where it is necessary to deal with the treatment integrity or fidelity, a multidimensional concept (Sanetti and Kratochwill 2009) which involves great complexity and, as with the formal aspects of manipulation referred to above, is essential in order to obtain valid conclusions regarding the results.

Attempting to embrace the widest possible range of nuances that the complexity of the term encompasses from the perspective of experts, a general definition of the term treatment integrity or fidelity might be the extent to which the researcher succeeds in faithfully operationalizing the treatment construct in its application, i.e., the degree and consistency with which the treatment is applied accurately. However any general definition is vague by necessity, so, specifically, this term implies that once the treatment is applied to a subject, it is applied to the degree required to suit the subject's needs and the subject actually responds to its implementation and not to other variables.

Distilling the information from the experts, it is possible to identify a theoretical component of this concept as well as a practical one. The former refers to the technical and formal aspects that make up the concept of treatment integrity, and the latter refers to the nuances and flexibility that these aspects necessarily suffer with the aim of achieving efficacy, efficiency and effectiveness in a particular case.

The first component implies a quantitative and a qualitative dimension, as outlined below:

The quantitative dimension involves both the components of the treatment and the characteristics of the subjects who receive it as well as the influence it has on them. Some of the variables in this dimension include those related to the protocol and the complexity of the intervention, the intervention time (the number of sessions and the time spent on them), the resources needed for its implementation (in terms of both material resources and professional diversity), the critical and/or supplementary active ingredients of the intervention, and the mode of application (individual or group). With regards to the variables related to the subjects receiving the intervention, these would include the motivation produced, the perceived effectiveness and usefulness, and the adherence to the therapist's instructions, among others. Since all of these aspects involve selection tasks, they necessarily relate to aspects attending to the differentiation of the treatments (Kazdin 1986).

The qualitative dimension includes all aspects related to the directing of the intervention, mainly involving the therapist. It is of vital importance, since the therapist is the link between the application of the treatment and its effectiveness. The quality of the intervention depends largely on these variables. The variables involved in this dimension would be, on one hand, the experience, skill, expertise, resources and attitude of the therapist in the implementation of the treatment, and on the other, the therapist's willingness to maintain his/her learning up to date (through research, attending conferences, etc.) and the ability and willingness to innovate and change aspects of the intervention if appropriate.

It must be borne in mind that the variables in both dimensions work together in a specific context (the clinic, family, school, etc.) which includes additional variables that moderate or mediate the integrity and reliability of the treatment (Sanetti and Kratochwill 2009).

With regards to the practical component, it must be considered that in a real situation it is not always possible or desirable to apply a treatment (whether implementing a program or a particular educational practice) in the rigid way its efficacy was proven experimentally or how it was originally envisaged. In real life, what matters is that the treatment is empirically efficacious in the specific case where it is required, and therefore, the treatment fidelity and integrity also involve this flexibility. It means ensuring that the positive changes, negative changes or lack of changes in the subject are due to the efficacy of the treatment because the subject has received what they need and the therapist has correctly done what was required (Durlack and DuPre 2008; Fryling, Wallace and Yassine 2012). This is the core of the Response to Intervention (RtI) movement. In the *Evidence-based Practice* framework this would be the bridge between the efficacy of a treatment demonstrated empirically through research and the effective practice for solving a particular problem, as we noted above.

This whole endeavor is known as treatment integrity or fidelity, undoubtedly one of the concepts that has generated the most research since it was first proposed by Yeaton and Schrest (1981) together with a model of evaluation and measurement. Treatment integrity soon aroused enormous interest both among researchers and among professionals of all of the social sciences, particularly education and health, especially in applied areas. Among other things, the reason for this interest was because a reciprocal relationship has been demonstrated between the integrity and effectiveness of treatments measured by the effect size (DuPaul, Eckert and Vilardo, 2012; Moyers et al. 2016; Solomon, Klein and Politylo 2012). Scientific journals of great impact have devoted special issues to this subject (*Clinical Psychology Science and Practice* in 2013; *Journal of Behavioral Education* in 2014; *School Psychology Review* in 2009). The reader of these monographs can form an idea of the significance of the term, both at the methodological level and substantively, as well as at the practical level, due to its importance in significantly increasing the quality of intervention services in schools (Glover and DiPerna 2007; Noell 2008; Sanetti and Kratochwill 2009).

THE GOLD STANDARD OF EXPERIMENTAL DESIGN: RANDOMIZATION AND CONTROL

As well as ensuring the validity of statistical inferences, randomization is the most effective control technique for testing the effect of the intervention. Formally, it assumes that all of the subjects have the same probability of forming part of any of the groups exposed to the different treatment conditions, and this probability is known. As a result, all of the variables that could contaminate the investigation, both known and unknown, are distributed equally between the groups, avoiding selection bias.

The homogeneity of the groups is difficult to achieve if the sample is small or the subjects too heterogeneous. In these cases it is possible to implement a prior restriction, stratifying the subjects with respect to any variable, and, within each of the strata, randomly assigning the subjects to experimental groups.

A good way of obtaining a sequence of random assignment is to use a random number generator, or even to toss a coin, with the aim that, in addition to random allocation, the sequence will be unpredictable for the researcher. This is of paramount importance. If the researcher knows the allocation criterion, it may interfere in the process and lead to selection

bias. If, however, both the person who performs the intervention and collects the result and those who receive the treatment are *blind* to the purpose, objectives and hypotheses of the research (the masking technique, double-blind and single-blind respectively), this also prevents the expectations that one or the other party may have or form from becoming potential biases that threaten the integrity of the treatment.

Showing that the treatment is effective means having a benchmark for comparison, a control group. A control group is simply an appropriate group of reference that can serve various purposes, from demonstrating the effect exerted by the intervention to demonstrating that the effects of two interventions are the same. Its function, however, is always the same: to control for bias, mainly selection bias. Control groups have a variety of names (no-treatment control group, placebo control group, active control group, wait list control group, etc.), reflecting either the way they are formed or the purpose they serve in the investigation.

Based on the above, it is easy to understand why randomized double-blind experimental designs with control groups are the gold standard for obtaining scientific evidence to prove a causal hypothesis.

The reality is less formal and less constrained, however. It is more common than it is desirable for the researcher him- or herself to be the one to form the groups and, whether consciously or unconsciously, to send the subjects to one group or the other (treatment or control) depending on their better or worse prognosis, the innovativeness or unpredictability of the treatment, their age, the comorbidity of the clinical condition, or the higher or lower risk to the subjects. Sometimes the researcher simply even leaves it to the subject to choose. In these cases, selection bias is what defines the formation of the groups. Even assigning the subjects to groups by seemingly innocent criteria such as the date of enrolment in the study (an odd or even number date), or alphabetically, etc. is never a good decision, precisely for that reason, because it makes the allocation system clear. All of these cases have one thing in common: the probability of belonging to one group or another is not the same for all subjects, and this, substantively, becomes selection bias.

It has been found that the effect size estimate is much higher (by 30 to 40%) when the randomization sequence is not adequately concealed, and the experts say that this is simply a reflection of a biased allocation (Als-Nielsen, Gluud and Gluud 2004; Gluud 2006; Jüni, Altman and Egger 2001; Schulz, 1996; Schulz et al. 1995; Schulz and Grimes 2002). Moreover, the experts are convinced that the random sequence generation is irrelevant in avoiding selection bias if it is not hidden until the assignment occurs.

If this problem exists in experimental research *in which the groups are formed*, it is even more complicated in quasi-experimental research in which the groups are almost always *already formed* and never at random. (In regression discontinuity designs, the groups are formed according to the pre-treatment measure). This is not at the whim of the researcher, but because there is no possibility of forming the groups at random, usually due to institutional constraints. At other times it is not ethical to do so. Sometimes the treatment is not even directly led by the researcher, but rather it is dictated by an organization, by government mandate, etc. When this is the case, there is also no control over the circumstances surrounding its application. This means that other variables, third variables, are concurrent with the treatment, and these will cause confounding effects. In these latter cases, the experiments are often called natural experiments or field experiments (Shadish, Cook and Campbell 2002; Trochim 2001). A comprehensive review of quasi-experimental designs has been carried out by Fernández et al. (2014a). Selection bias is even more pronounced in non-

experimental research, which is always conducted in natural environments and no treatment is applied.

But what is selection bias? Selection bias is a complex toxic ingredient, responsible for the systematic differences between comparison groups in their response to the treatment or in their prognosis. It occurs when variables related to the *dependent variable exist in varying degrees among the groups under comparison* (due to distortions in the procedures used to select the subjects, due to factors influencing participation in the study, etc.) and these variables may be different from the ones registered. In other words, variables such as age, sex, etc. may not be the cause of bias, depending on the sample, despite these being the ones that are usually recorded (Fernández et al. 2014a). What is indisputable is that selection bias is the greatest enemy of statistical and substantive inference (Meng 2006, 2012).

In the following sections we will outline what we can do to limit selection bias and to test hypotheses concerning the effect exerted by third variables.

HOW TO LIMIT BIAS: PROPENSITY SCORES

The Propensity Scores (PS) technique is the statistical tool that allows us to find, for each subject in the Experimental Group (EG), a similar subject in the Control Group (CG) with respect to the variables that may be related to the treatment response, which therefore may be responsible for some of the observed variability in the dependent variable.

By using PS we can achieve a balanced distribution of all of the levels of all of the important covariates in all of the groups that will be subject to comparison in the investigation. In other words, we succeed in emulating experimental designs, achieving homogeneous groups, and we will obtain unbiased estimates of the treatment effect.

Thus, the PS is a solution for controlling selection bias in investigations where the random assignment of subjects to groups is not possible, whether they are quasi-experimental or non-experimental (observational, cohort, etc.) research investigations.

Philosophy

The validity of this statistical mechanism for testing hypotheses of causality in non-randomized investigations rests on a strong philosophical substrate called the Neyman Rubin Causal Model or the potential outcomes or counterfactual model (Rosenbaum and Rubin 1983; 1985). To avoid going into too much detail, we simply indicate five highlights, which we believe are sufficient in order to understand this:

- According to this model, the only possible way to estimate a causal effect is through crossover designs in which the subjects are exposed to all of the conditions of observation in a controlled way by the researcher, and respecting the time between exposures to avoid residual effects and order effects. The subjects' response to both treatment conditions can only be known this way.
- If this is not possible, and we must compare one subject to another, or one group of subjects to another, then what is known as the allocation mechanism comes into play.

This is simply the decision process that is used to assign some subjects to the active treatment and others to the control group (for example). This decision process can be random or not random.

- When it is random, we assume that the probability that any given subject (with all their individual characteristic variables that may affect the treatment response) is in one group or the other is 0.50. So, the average response for the EG is what would be expected for the CG if its subjects had received the treatment. (The counterfactual is the knowledge of what would have happened to the people who did not receive treatment if they had received it.) The opposite is also true; the average response of the CG would be the same as the response the EG would have had if they had not received the treatment. When the mechanism is not random, the probability that a subject is in one group or another is determined by a number of variables that may be involved in the response to treatment and it will no longer be 0.50.
- This probability is the propensity score that we are going to estimate because we do not know it, and we will do so by using the technique of propensity scores. Technically, Rosenbaum and Rubin (1985) define:
- "the propensity score for subjects i (i = 1,….., N) as the conditional probability of being assigned to a particular treatment (Wi = 1) versus no treatment (Wi=0) given a series of observed covariate vectors xi prior to receiving the treatment: $e(xi) = pr(Wi=1|Xi=xi)$".
- Subjects who have equal propensity scores but are in different groups (one in the EG and another in the CG) are comparable because their response would be the same if they had been in identical conditions.

Thus, using this statistical tool we estimate the propensity scores, i.e., the probability that subjects have of being in one group or another based on a number of variables. We will retain only the subjects with identical PS, in order to create our own private oasis free of selection bias, and we will have two (or more) groups of equal subjects which can be compared with assurance regarding the intervention variable.

How to Calculate the Propensity Scores: We Propose 4 Steps

1. To calculate the PS, it is necessary to segregate from the database the dependent variables that we aim to analyze. We then re-enter them after calculating the PS. By doing this, we achieve two things: we emulate the experimental method, in which it is not known a priori in which group each subject will be, and we eliminate actual or potential experimenter bias.
2. Selection of variables. We will use a PS prediction model for this. The best model is the most comprehensive one, which includes all of the important variables that are imbalanced in the groups. Since not all of the variables are equally important, the first thing to do is to divide them into groups of priority.

   Without a doubt, the first thing is to identify the moment of assignment to the treatment. This is of utmost importance because it will allow us to identify the variables (of subjects, context, etc.) that most likely determined why the subjects are in one group or another. These are the most appropriate variables for calculating the

PS, and we already have their measure prior to carrying out the treatment. If the decision has been influenced by a covariate that has not been registered or is unavailable for some other reason, it will be impossible to determine whether the treatment groups are balanced with respect to this covariate. Consequently the data set may not be useful for addressing the issue raised in the study due to the potential selection bias.

Next it is appropriate to review the literature on the subject, so as not to leave any important variables outside the model.

Finally we select all of the intrinsic subject variables (i.e., variables pertaining to the individual, which cannot be modified, such as age, sex, etc.). Only the variables recorded prior to the treatment application can form part of the model. Any variable recorded afterwards would now be a response, and cannot be used because it would mask the effect of treatment; we would be making a specification error with fatal consequences, obtaining a biased estimate of the effects.

3. Model generation. The PS are obtained by a binary or multinomial regression equation logistic in which the dependent variable is the probability of receiving the treatment or exposure in the study [p(x) = Pr (D = 1)], and the independent variables (x1, x2….xn) are the covariates introduced into the model. The adjusted values obtained from the logistic regression are the estimated propensity scores. The propensity scores can be calculated using other statistical methods: discriminant analysis, classification and regression trees (CART) and neural networks (Pattorno et al. 2013).
4. Evaluation of the discrimination of the PS. After calculating the PS, its ability to separate and classify individuals according to their higher or lower probability of receiving the treatment is verified.

What Can You Do with Propensity Scores?

Once calculated, the PS can be used as a tool to homogenize the groups by matching or by stratification, or it can be used as a covariate in regression analysis (see Guo, Barth and Gibbons 2006; Guo and Fraser 2010).

Matching

Typically matching is carried out based on a single variable that is not well balanced between the EG and CG subjects in order to try to make them more alike. There are four techniques that are most commonly used: the nearest neighbor technique, radius matching, weighted matching, and Mahalanobis distances. The first one is the simplest: for each subject in the EG, the subject in the CG whose PS is closest to him is sought. This technique does not define a boundary that differentiates what is close from what is not however. Therefore, if the sample size is small we may not achieve the proposed objective. The other three techniques delimit proximity based on certain criteria. For example, matching by radius delimits the proximity between the PS, limiting the maximum difference that there must be between the two to an interval between ± a certain proportion of its standard deviation. [This is usually P(Z) ± 1/2 ES if the distribution P(Z) is normal or [Logit de P(Z) = Log {P(Z)/ 1-P(Z)} ± 1/4 ES if the distribution is not normal]. What can happen with these other techniques is that if

the radius is too small, the corresponding control may not be found for a patient in the treated group.

Stratification by PS

In this case the PS are calculated based on a model that simultaneously incorporates all the variables of interest. Then the strata are defined based on a criterion, one of the most common being the quintiles of the PS. Experts believe that five strata based on quintiles are generally sufficient to reduce at least 90% of the bias or confounding by all of the covariates used in the model (Pattanayak, Rubin and Zell 2011). This criterion should not be accepted as valid until it is checked. Success is achieved when it is explicitly verified that the empirical distribution of the different levels of covariates are balanced in the groups. Descriptive statistics, significance tests or a simple standardized difference are sufficient to check this. If it is not satisfactory because some relevant variables fail to balance, the creation of more than five strata can be considered. If the balance is still not achieved, the underlying model of the PS should be reviewed and modified and the whole process re-done.

Covariate in the Regression Analysis

In this case the PS may be included as a covariate in the regression analysis both as a continuous variable (a single vector) and as an ordinal variable (stratified), alone or together with other covariates. It can correct the imbalance between the groups produced by all of the covariates used in the PS model. This would guarantee that the assumptions of the analysis of covariance are met; the covariate will not be related to the treatment because it only contains variables registered prior to the treatment, and the covariate will be equally distributed in all groups and will therefore have a similar effect on the dependent variable in all of them. Consequently, the estimation of the parameters will not be biased and the inferences will not be confounded.

The Problems or Disadvantages of PS

The usefulness of PS in controlling selection bias and avoiding the confounding of extraneous variables in investigations where it is not possible to randomly assign subjects to groups is undisputable. Its usefulness is also unquestionable when research groups, even though they could have been randomly formed, have been poorly formed according to an arbitrary criterion by the investigator, as mentioned in the previous point. However the PS is not free of problems and limitations (see Glynn, Schneeweiss and Stürmer 2006; Pirracchio, Resche-Rigon and Chevret, 2012; Rosenbaum and Rubin, 1983; Rubin 2008). The main limitations are:

- Propensity scores are more reliable with large samples.
- Unlike randomization, propensity scores do not enable us to balance the characteristics or covariates that were not recorded or observed prior to the application of the treatment. If there is any important variable that does not exist for all subjects there will be a hidden bias for which it is impossible to control.
- This technique requires large samples in order to obtain pairs for as many subjects as possible, although it has proved useful with subject samples even as small as 40.

- When the groups have been poorly formed arbitrarily, it is possible that, for some subjects of the EG, we do not have subjects in the CG because of the particular approach used in the original allocation. In this case, we must eliminate these subjects because it is not possible to estimate the treatment effect for them. Furthermore the possibility of generalizing the results of the investigation is reduced.
- All of the techniques for calculating the PS are multivariate techniques, and therefore they do not allow subjects with missing scores. This is a major problem because the PS does not control for the bias they produce.

In short, with the PS we are able to contain the whole multidimensional load of the differences between the research groups in one single variable. If it is done successfully the advantages are undeniable. The distribution of the covariates is the same between the CG and the EG, and we will have managed to break the link between the treatment variable and self-selection or the mechanism of initial non-random assignment. We have managed to control the selection bias. Now, the extent to which this bias is reduced depends mainly on the way the matching is carried out and the richness and quality of the covariates on which the PS are calculated. If the strata are not identified correctly, if an optimum overlap is not reached or if there is an insufficient number of cases, the statistical and substantive conclusions will be seriously threatened.

HOW TO CONTROL THE EFFECT OF THIRD VARIABLES: MODERATION, MEDIATION, CONFOUNDING AND COVARIATION

Treatments that are tested in any field under the umbrella of the social and health sciences may work or they may not, but if they work, three things are true. One, they work due to certain active principles that are absolutely decisive. Two, there is no treatment that is universally valid or equally effective for all subjects. And three, the treatments do not work alone; they are immersed in a context (the school, family, hospital, etc.) which determines their course as well as imprinting the active principles on the treatment. Therefore, except in situations involving strict control, the treatment is neither isolated nor is it immune to all of the subject and context variables that will determine how the treatments work, when and at what time they will promote the change, and for whom and/or under what conditions a contextual treatment is more or less effective. Depending on the source they come from and the function they carry out, these variables are called mediators, suppressors, spurious, moderators or covariates (see Ato and Vallejo 2011). Briefly, starting with the simplest possible situation where there is only one independent variable (X) and one dependent variable (Y), it is possible that some other variable may appear (Z), exercising any of the abovementioned functions.

They will occur as follows:

Mediating variables: These are the active variables necessary for the treatment to be able to be conducted with assurance. They explain how and why the independent variables produce their effects. From a causal perspective, they are intermediate variables necessarily positioned between the variables X and Y. This means that X precedes Z, and Z is correlated

with both X and Y. Thus, without the presence of Z the effect of X on Y would be null (total mediation) or very weak (partial mediation).

Suppressor variables: These are variables that will always be correlated with X, and may or may not be correlated with Y. However, in its presence, and depending on the size and direction of the various correlations that are involved in the model, they cause an increase of the effect of X on Y. Like the mediation effect, the suppression effect can be diverse and three possible states are considered: traditional, negative and reciprocal (Conger, 1974; see also Cohen et al. 2003).

Spurious or confounding variables: These variables are necessarily related to both X and Y, they are concomitant with the variable X, and they are solely responsible for the change observed in Y. When this happens it is said that the relationship between X and Y is spurious or confounded. This is because in reality X either has no relationship on Y (totally spurious effect), or it has a very weak relationship on Y (partially spurious effect). It is considered therefore, that the X variable is irrelevant.

When there are mediating, suppressor or spurious variables, we consider that all of the effect observed in Y is not due solely to the variable X, but rather that due to X alone there is an effect we call direct (which may be weak or even non-existent) and the rest is an indirect effect. The magnitude of this indirect effect depends on the degree to which X affects Z (third variable) and Z affects Y, controlling for the influence of X.

Moderating variables: These are variables that influence the strength of the relationship between X and Y (reducing, increasing or even canceling it) or that influence its direction. (They may even reverse the relationship). These variables *explain in which subjects, which characteristics of the subjects* (comorbidity, gender, stage of the life cycle, IQ, previous treatments received, etc.) and *which conditions or circumstances* (social, family, etc.) the treatment is more effective, less effective, or even innocuous. Therefore, from a causal point of view these moderating variables always work as independent variables, and consequently they are found at the same level. Unlike moderating variables, the independent variables do not exert an indirect effect, but rather they interact with X. Ideally they are not correlated with either Y or X.

Covariates: Covariates are subject variables that are mainly related to the dependent variable and consequently infuse much variability into it causing the treatment effect to be eclipsed and making it impossible to detect or partially detect it.

These variables are very similar to moderating variables; at times they may even be moderating variables. The main difference is that covariates can be easily affected by the treatment. This implies that they must always be registered prior to the treatment application. Moderating variables, however, are never affected by the treatment.

Data Analysis

We are always going to suffer the effect of these variables. We suffer when they are unknown to the researcher because no conclusions drawn from the data will be correct, simply because the model that explains the data is automatically incomplete. When the variables have been registered however, the problem is how to demonstrate it. Let us take a look.

Assuming that there is no selection bias or lost data (and if there is, we have solved the issue appropriately), when we examine the relationship between an X variable (treatment) and a Y variable (dependent) without taking into account other variables that are also present, statistically there are only two possibilities: either we find a statistically significant relationship between them or we do not. In the first case, the treatment may be responsible, but not solely responsible, (i.e., the relationship may be partially or fully mediated, or it may have a suppressor variable, or there may be a partially or totally spurious effect, or there may be a covariate with a weak influence, or a moderator variable with casually favorable values for that relationship). Alternatively, the X variable may not be responsible at all (i.e., there is a totally spurious effect). In the second case, in which we do not find a relationship between X and Y, it might actually be that the variable does not exert any influence on Y, or it may be that in fact X does significantly affect Y but we do not detect this because there is a moderator variable with unfavorable values for that relationship, or there is a covariate that exaggeratedly increases the error variance. However, the reality is more complicated still, and the coexistence of different variables is possible with complementary or conflicting effects (multiple mediators or moderators, together or combined, resulting in moderate mediation or mediated moderation, etc.). Sometimes the relationship is not linear or continuous; there may be even bidirectional relationships (on the causal network, we recommend consulting Funnell and Rogers 2011; Robins and Greenland, 1992; Shadish 2010).

Of all of these effects described, the mediation effect has been the most widely analyzed (Iacobucci, Saldanha and Deng 2007). The most widely used method for this has been and still is the sequential method by Baron and Kenny (1986) (see MacKinnon et al. 2002; Wood et al. 2008). However, the method of Baron and Kenny conducted in 4 steps using simple regression equations is limited, and it is unable to show all of the possible situations described. Many revisions have been made to their model (Ato, Vallejo and Ato 2014; Bullock, Green and Ha 2010; Cheung and Lau, 2008; Iacobucci, Saldanha and Deng, 2007; Kraemer et al. 2008; Pardo and Román 2013; Spencer, Zanna and Fong 2005; Zhao, Lynch and Chen 2010). These have questioned both the rigidity of their causal model and each of the technical and statistical aspects encompassed in each of the 4 steps, as well as the limitations of the regression model in addressing all of these possible situations.

A much more powerful and flexible alternative for testing these effects is the approach of structural equation modeling (SEM) for several reasons. Firstly, it enables us to contemplate complex situations such as those we have described, providing strong empirical evidence for or against the hypotheses that these relationships imply. Secondly, it allows us to correct for measurement error. Thirdly, the indirect effect (the most important effect and the one most sought in mediation analysis) and the interaction (moderation) effects are estimated directly without the need to perform successive inferences, and SEM provides a variety of fit criteria to the models, thus facilitating the decision. Furthermore, SEM is the only option when we have latent variables and when we need multiple indicators of the construct; both variables (the cause variable and the mediating variable) can even be latent variables. These are sufficient reasons for SEM to be the option recommended by the authors referred to in the previous paragraph.

However, just as with regression models, there are many precautions that should be taken. Aside from the satisfaction of the assumptions (normality, homogeneity of variances, independence of errors and linearity), it is necessary to monitor the possible multicollinearity and the errors due to the incorrect specification of the causal model. We must also make

statistical adjustments in order to make comparable the regression coefficients of variables measured on different scales. In addition, a large sample size is necessary; the more complicated the models that are tested and the more variables they contain, the larger the sample must be. Despite being the best option for analysis, our hypotheses should be examined from different points of view, always being led by the substantive theory, and carrying out sensitivity analyses before concluding in favor of our hypotheses or not (Ato, Vallejo and Ato 2014).

On the Way on Our Journey to Parnassus

We stop ourselves, not because there is no more to say –for there is, and so much more–, but because when one is part of a collective work, prudence with regards to its extension is imperative. We hope to convey the idea that research on a particular topic, for example education to which these pages are dedicated, is heterodox in its methods, and the experimental control must always be obsessive. We must assume that selection bias is not anecdotal. It is the greatest danger for inference, and can come from any front (from the sample, from the variables selected, etc.). Of all of the methods, there is not one fail-proof method, nor one perfect approach. However, what we can do is have strategic plans for prevention, to be used if necessary. This will always be better –never perfect– but better than an approach in desperate circumstances. Our aim is for every researcher in education to read this piece of work, as a source like the *fountain of Castalia*, to take note and not to stop along the way. There is much more to say, and much more to be learnt. (Important issues such as hierarchical models or the problem of missing data, for example, might have occupied this space instead of the topics discussed. Instead we refer the reader to the work of Fernández et al., 2014b). This would be a good place to start. (A homage to Cervantes, on the 400th anniversary of the year he died).

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INDEX

E

F

G

H

I

K

L

M

N

P

Q

R

S

T

U

V