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Cognition, Metacognition and Learning

Abstract: This article presents a theoretical review of the difficulty that exists at the moment to understand and comprehend metacognition, given the problem that the construct itself involves. In addition, it is a complex concept to measure and apply to the educational world and the teaching-learning process. This article discusses the importance of cognition and metacognition, as it establishes a clear difference between the two. A theoretical review of metacognitive research is presented, differentiating the existing research studies on control and cognitive regulation from the research work that examines metacognition in the educational field. This article also reflects on the state of metacognitive measurements and the difficulties of capturing metacognitive magnitude and scale with regard to the capability of transferring these concepts to the educational world. It discusses viable ways to achieve a better development of the autonomy of students, being reflected in a 'learning to learn' action that transcends the school environment and is projected to all facets of meaningful learning.

Keywords: learning, educational process, cognition, metacognition, metacognitive measurement, learning strategies

Introduction

As is also the case with the concepts of intelligence and giftedness, there is no unanimity when defining the construct of 'metacognition'. Although metacognition has been widely defined by Flavell as "knowledge concerning its own cognitive processes and products, or anything related to them, such as active control and the consequent regulation and organization of these processes" (Flavell, 1976, p.231), there is currently some controversy as to what exactly should be defined as metacognition. For example, a certain object of simple knowledge (such as the knowledge of what strategy to use for a particular problem, or the knowledge of the strategies to use to remember something) can be called metacognition. Now, as Gentile (1997) explains, "if the knowledge of the circulatory system itself, of what affects it, and of what strategies to keep it in optimal functioning are considered as cognitive strategies … why should knowledge about self-learning and about one's own memory not also be considered as cognitive processes?" (p.124). In essence, this argument attempts to limit metacognition to active control, to conscious control, or to the executive regulation of mental processes. In any case, this line of discussion is fruitful, because metacognition seems to have undergone *a drag of the construct* at the time of coining a unanimous term, which is commonly accepted by the theorists of the topic (Booth and Hall, 1994; Burón, 2012; Cardelle-Elawar, 1995; Allal, 1998). Consequently, different authors have used this term to refer to everything related to the knowledge of strategies, with the executive control of the strategies, and with the self-control of the activity, in terms of aspects as varied as: the checking of solutions to linear equations, enumerating possible strategies to deal with a problem, detecting errors within a reading text, predicting degrees of knowledge, the knowledge of different sources of motivation and the self-correction of errors (Cámara, Monteagudo and Paz, 1996; Burón, 2012). Although it seems that all these processes are common when new constructs appear and generate considerable enthusiasm, it is necessary to reach a clear and objective conceptual definition about what metacognition is, even assuming the risk of everything involved in the

process of becoming metacognition (Ehrlich, Remond and Tardieu, 1999; Alluela, 2007), in which case the construct loses meaning. In reality, it is not easy to describe what makes certain thoughts or feelings metacognitive and not simply cognitive (Nelson and Narens, 1994; Narens, Graf and Nelson, 1996). The descriptions are difficult because metacognition, by its very nature, is a "diffuse concept" (Flavell, 1987, p. 23), which has been complicated still further by the little uniformity in the theoretical *corpus* of the different investigations on the subject. This is due to the fact that these come from very varied disciplines and to the objectives pursued, which are also very different (Yussen, 1985; Bransford, 2000).

Metacognitive research

What really distinguishes cognition from metacognition? Certainly, one of the most important distinctions to be made relates to the links that have been established between cognition and metacognition. According to Kagan and Lang (1978), cognition is a general term used to aggregate, globally, the processes that a person involves or implies in: (a) the extraction of information from the outside world; (b) the application of knowledge prior to the information recently received; (c) the integration of both to create new knowledge; (d) the storage of the information in the memory so that it can be retrieved and used later; and (e) the continuous evaluation of the quality and logical coherence of the mental processes and products of that person. In summary, cognition refers to the acquisition, application, creation, storage, transformation, evaluation, and utilization of information (Díaz and Fernández, 1998; Aragón, 2009). Cognition groups cognitive processes, i.e., "the internal mechanisms or protocols that a person uses to perceive, assimilate, store and retrieve information" (Antonijevich and Chadwick, 1982, p. 307–308). However, what are the differences that can be established between cognition and metacognition? An approximate answer has been provided by Haller, Child and Walberg (1988), which Acereda (2017) collects in the following table.

Table 1. Differences between Cognition and Metacognition (Acereda, 2017, based on the work of Haller, Child and Walberg, 1988)

COGNITION	METACOGNITION
Reference to processes or operations that are in progress	Supervision or vigilance, on the part of the apprentice, of the mental operations that are underway; that is to say, supervision of the cognitive processes that are activated during the accomplishment of some task or the coping of some problem whose solution raises some intellectual requirement
Processes or strategies that are activated by the apprentice in an effective way	Construct that refers to: 1. What a person knows of his cognitions 2. The person's ability to control their own cognitions

On the other hand, many researchers have coincided in pointing out that metacognition, based on their attempts at a definition, is a construct equivalent to concepts such as meta-attention, meta-memory, meta-comprehension, etc. From the perspective of Mayor, Suengas and González (1993), it could be considered that as many metacognitive modalities as cognitive processes exist, such as meta-representation, meta-memory, meta-language, meta-thought, meta-attention, meta-motivation, meta-perception, meta-learning, etc., which makes it difficult to study metacognition as a construct (Monereo and Castelló, 1997; Domenech, 2004).

Even so, and understanding the fundamental difference between metacognition and cognition, we have to go beyond the question of what it is and address the question of how metacognition has frequently been studied. Adopting a constructivist viewpoint, which is so prevalent in current education, one can come to argue that the realities we know reflect the ways in which we meet them (Negrete, 2007; Monereo, 1997). Regarding this, Glasersfeld has provided an additional elaboration of this argument: "The sense of experimentation creates the structure in the flow or sway of its experience; and this structure is what the conscious cognitive organisms experience as reality" (Glasersfeld, 1984; p. 38). Therefore, the knowledge that researchers have obtained from metacognition can be clarified more thoroughly if we look at the ways in which they have obtained it (Greeno, Collins and Resnick, 1996; Morín, 2001).

The majority of the first investigations in the field of metacognition were descriptive in nature, and in them the authors tried to describe and explain general models of development of the knowledge of children with regard to the processes of memory, particulary certain processes concerned with the conscious and deliberate storage and retrieval of information (Doly, 1996; Nicasio, 2008). However, as the studies changed from a descriptive approach to an empirical one, there came to be a growing need to expand the methodology being used, to increase the number of studies carried out, and to classify the growing literary compilation on the subject. Several classification designs have been used to group, analyze, and evaluate these studies (e.g. Cavanaugh and Perlmutter, 1992; Pascual-Castroviejo, 2002; Schoenfeld, 1987), and despite the fact that there are substantial differences between them, it can be noted that in these classification designs there are constantly three general categories, which have recently been joined by a new category (Osses and Jaramillo, 2008; Organista, 2005). We must analyze these four categories more closely.

1. Cognitive control studies

This first category includes the various studies carried out on cognitive control. These studies had, as their main objective, the examination of humans' knowledge of their own knowledge, their processes of thought, and how they can exactly control the current state of their knowledge and their thought processes (Kluwe, 1987; Schoenfeld, 1992). Many of these studies assessed the predictions of their performance; that is, the predictions of what knowledge is stored in memory, and the assignment of effort and attention; that is, the allocation of the study based on their own judgments on the knowledge that is or is not currently in the memory (Schneider, 1985; Pozo, 2003). Frequently, verbal reports that subjects performed during a memory task execution were used to determine what memory knowledge the subject contributed to the task (Cavanaugh and Perlmutter, 1992). In this regard, it should be noted that, in reality, the ability to control one's knowledge and thought processes is not a trivial matter in terms of education, since educators today have

a keen interest in self-regulating learning. "Theoreticians unanimously consider that the most effective apprentices are self-regulating" (Butler and Winne, 1995, p.245), and the key to effective self-regulation is the exact self-assessment of what is or is not known. Only when students know the state of their own knowledge can they effectively self-direct the learning of what they do not know (Mateos, 2001; Pena, 2003). Therefore, knowing if students can accurately control their knowledge and thought processes and if the memory control of complex tasks can be taught to younger children are the dominant concerns of the teachers, as well as of the researchers and theorists interested in encouraging the self-regulation of learning (Domínguez and Martínez, 1997; García, 1995). Basically, the results obtained from most of the studies of this first category in metacognitive research have shown that even kindergarten children can accurately control their knowledge. However, as age increases, subjects advance and progress not only in terms of their amount of knowledge and what they can store in their memory, but also in how they can accurately control their knowledge (Sáiz and Guijo, 2010; Rodríguez, Fernández and Escudero, 2002). But when it comes to judging the ability to control one's memory, it is important to consider other important aspects, rather than just age, such as the types of thought processes or knowledge that are being controlled (Carr and Borkowski, 1987). When memory control tasks are simple and do not overload the working memory (for example, simple remembrance or recognition tasks), there are few differences between young children and older children (Gourgey, 1998; Casajús, 2005). But as the complexity of the tasks gradually increases, such as in of the use of strategies to allocate a greater time of study to the most difficult items, it becomes more and more difficult to manage the processes of thought necessary in order to complete them (Trillo, Plata, Peña, Segura, Crespo and Labraña, 1996).

2. Studies on cognitive regulation

The second category of metacognitive research includes studies that have examined the "regulation of the own thinking processes to cope with the changes that demand different situations and circumstances"

(Kluwe, 1982, p.210). Many of the early studies in this category were focused on educatable mentally deficient children, such as the studies by Brown and Campione (1980) and Butterfield and Belmont (1980), among others. More recently, however, research studies have focused on a broader spectrum of children's representative capacities. In these studies, the subject was taught a strategy to complete a specific task. Once the subject had demonstrated the dominance of the strategy, he was provided with another task (i.e. the transfer task), different from the first one but structurally equivalent to it (Tardif and Merieu, 1996). The subject then had to decide whether to use the taught strategy, modify it, or abandon it in favor of a different strategy. Thus, as the subjects learned a strategy to facilitate performance in tasks of instruction, the researchers examined whether these subjects developed a metacognitive awareness of the usefulness and function of the strategy (Tardif, 1992), which is essential if they regulate the application and modification of strategies to solve new situational demands. The results of most of the studies carried out in this second category of metacognitive research coincide in pointing out that young children can be trained to control their behavior and strategic functioning, and that this training can improve the regulation of effective strategies (Yan, 1991; García, 2001; Gravini and Iriarte, 2008; Joseph, 2006). On the other hand, if subjects are taught to have metacognitive awareness as to the usefulness and function of a strategy while being taught that strategy, they are more likely to generalize it to new and diverse situations (Flavel, 1999; Georghiades, 2004).

3. Studies on cognitive control and regulation

This third category includes studies in which both the control and regulation of cognition are examined. In these research studies, the subject controls the information available during the course of his or her own thought, and then uses this information to regulate subsequent memory processes. Often, they all focus on how subjects are served by the strategies of organization or elaboration in memory, and how strategies can be used to improve performance (Schneider, 1985; Sternberg, 1998). The primary objective of these studies is to discover what and how much

people know about memory that is relevant to good performance in a particular memory task (Cavanaugh and Perlmutter, 1992). Furthermore, it should be noted that Paris and Winograd referred to this category of research as self-management studies, i.e. studies of "metacognition in action" that help "organize the various aspects of problem solving", and that include "the plans that apprentices make before they address a task", "the adjustments they are making as they work on it", and "the subsequent reviews they perform" (Paris and Winograd, 1990, p.18). According to Kluwe, these studies, together with the studies of the second category that we have already analyzed, show which "is the nucleus of metacognition" (Kluwe, 1982, p. 211). In many of these studies, students were instructed to scan strategies to facilitate remembrance; in others, students were observed regarding the spontaneous use of strategies (Sanmartí, Jorba and Ibáñez, 2000; Rodríguez, 2009). The importance and relevance of the relationships between the items to be remembered have been used as much as the importance and relevance of the relationships between the types of items and the knowledge base of the students (Doudin, Martin and Albanese, 1999). In some studies, metacognitive control and metacognitive regulation have been only inferred if subjects can verbalize how their memory was facilitated by using a classification strategy (Maki, 1997; Carr and Thompson, 1995).

4. Studies examining metacognition in the educational field

More recently, a fourth category of metacognitive research has emerged, given that the central focus of the theoretical aspects of metacognition, which has dominated metacognitive research since the 1960s, has lately generated an equally important nucleus in educational applications. Many researchers, convinced of the educational importance that metacognitive theory has for teachers and students, are shifting their attention from the theoretical framework to the applied field, from the laboratory to the school classroom. For example, Borkowski and Muthukrishna argue that metacognitive theory has "considerable potential to help teachers who strive to create a class environment focused on strategic learning that is both flexible and creative" (Borkowski and Muthukrishna, 1992, p. 479).

Paris (1991) and Paris and Winograd (1990) consider it essential that "students can improve and reinforce their learning through adequate knowledge of their own thinking, how they read, write, and solve problems at school. Teachers can promote this knowledge by directly informing students about effective problem-solving strategies and discussing with them the cognitive and motivational characteristics of thought" (Paris and Winograd, 1990, p.15). Hence, this fourth category of metacognitive research includes studies that have examined the various ways in which metacognitive theory can be applied to the educational field (Genick, 1996; Calderhead, 1996; Scheneider and Pressley, 1998; Sáiz and Guijo, 2010).

These research studies have focused on a fundamental question: can the instruction of metacognitive processes facilitate learning? The researchers who have contributed to this current trend in metacognitive research have responded to this question with a strong affirmation, and the proof of this is the various studies that have been carried out. For example, as Sáiz and Guijo (2010) explain, Davidson, Deuser and Sternberg have provided answers to the issue in the general domain of troubleshooting; Dominowski in the domain of the verbalization of cognitive processes; Vye, Schwartz, Bransford, Barron, Zech, and others in the domain of science; Barberà as well as Carr and Biddlecomb in the domain of mathematics; both Castelló and Sitko in the domain of writing; Solé, and Otero and Hacker in the domain of reading; Maki in the domain of the prediction of the tests; Winne and Hadwin in the study domain; Monereo in the domain of taking notes, and Dunlosky and Hertzog in the domain of problem solving (Sáiz and Guijo, 2010, p. 87–88). All of these researchers are most likely to agree that, in order to reinforce learning more fully, students need to get to know each other and be self-aware as auto-regulatory bodies that can achieve specific goals consciously and deliberately. This is because, in general, metacognitive theories focus on: (a) the role of the conscious and executive management of their own thinking; (b) individual differences in self-assessment and management of their cognitive and learning development; (c) the knowledge and executive capacities developed through experience; and (d) constructive and strategic thinking (Acereda, 2017). Consequently, the promise of metacognitive theory is

that it focuses precisely on those characteristics of thought that can contribute to the understanding and awareness of students to be self-regulating organisms, i.e. to be agents of their own thought (Tamayo, 2006; Silva, 2004). At this point it is necessary to raise another essential question: what are the most frequently used *measures* to carry out metacognitive research? In the same way, and derived from this question, is it possible to probe what the *problems* that scholars usually encounter are when they confront this complex construct?

The state of the metacognitive measure

Without a doubt, the concept of metacognition has emerged as an important construct in two main fields: psychology and education (Brown, 1987; Campione, 1987; Brown and Campione, 1996). There is growing empirical evidence regarding the fact that metacognition is an important component of intelligence and cognition (Meier, 1994). Similarly, this evidence suggests that metacognition exerts an important influence on academic success (Borkowski, 1985; Sternberg, 1984). However, as Meichenbaum, Burland, Gruson and Cameron (1985) indicate, few research studies have examined whether the techniques commonly used to measure metacognition are adequate and sufficient, although much of the success of most research efforts depends on a reliable and valid measuring base (Ward and Traweek, 1993). Based on the enthusiastic support of researchers who consider metacognition as a key ingredient in the advancement of education in the promotion of independent learning (Spring, 1985; Tei and Stewart, 1985), and also on the basis of the 'lamentations' of Lloyd and Loper (1986) concerning the lack of a normative and standardized tool to be used by educational professionals, it is particularly important to identify a series of psychometric measures that are reliable, sound and appropriate (Meier, 1994), so that professors and psychologists can use them to control and solve the metacognitive problems of their students. Regarding this, for Mayor, Suengas and González (1993) and for McClendon (1994), there is no doubt that one of the major

problems facing research and professional practice in treating metacognition is how to detect, isolate and manipulate it. The problem arises from the intrinsic difficulty that exists in operationalizing metacognitive activity, since it does not translate directly into observable responses. In turn, they point out that "evaluating metacognition is a meta-metacognitive activity" (Mayor, Suengas and González, 1993, p. 145), an observation that helps to differentiate between evaluating cognition (cognitive activity) and evaluating metacognition (meta-metacognitive activity). On the basis of the above, we will now explain the main existing instruments used to date to evaluate metacognition. However, for the purposes of this article we will only focus on the analysis of the measures of general metacognition and self-regulating measures. Therefore, let us now turn to what the most significant instruments are for evaluating metacognition.

1) General metacognition measures

As has been pointed out throughout this article, general metacognition is commonly described as the highest-order cognitive functioning, covering such determinant aspects as control, prediction, verification of reality, and/or coordination of cognitive functioning, or awareness of the knowledge and ability to understand, control, and manipulate individual cognitive processes. In this regard, different ways of operating have been proposed to constitute significant measures of general metacognition, based on three main categories: retrospective self-reports (questionnaires), retrospective self-reports (interviews), and behavioral observations. The main instruments used to evaluate general metacognition are:

1. The Metacognitive Questionnaire (MQ) (Howard-Rose and Winne, 1993).
2. Metacognitive Inventory in Multiple Contexts (MMCI) (Allen and Armour-Thomas, 1993).
3. The Metacognitive Questionnaire (Swanson, 1990;1992).
4. The Dynamic Evaluation of Metacognition (DAM) (Clements and Nastasi, 1990).
5. Interview Methodology

6. The Metacognitive Questionnaire (Mayor, Suengas and González, 1993).
7. Learning and Study Strategies Inventori (LASSI) (Weinstein, Schulte and Palmer, 1987).
8. ACRA. Abbreviated for Students (De la Fuente and Justicia, 2003).
9. Evaluation Questionnaire of the Learning Strategies of University Students (CEVEAPEU) (Gargallo, Suárez and Pérez, 2009).

2) Self-regulating measures

This area of metacognition is the one with the fewest instruments of evaluation, either because it is the least investigated area, or because the researchers focus primarily on the use of the technique called the task of the "Tower of Hanoi" (Welsh, 1991). From our perspective, we believe that self-regulation involves planning, controlling, and adjusting cognition to achieve a goal or goals set beforehand. However, within the measures of self-regulation we can find techniques such as retrospective self-reports and behavioral self-reports. The main instruments for evaluating self-regulation are:

1. Motivated Strategies Learning Questionnaire (MSLQ) (Pintrich, Smith, García and McKeachie, 1993).
2. State of Metacognition (O'Neil and Abedi, 1996).
3. The Structured Interview (Zimmerman and Pons, 1986).
4. The Task of the Tower of Hanoi (Welsh, 1991).
5. Regulated Learning Questionnaire (Torre, 2007).

With regard to the *problems* to be noted as to the complexity of seizing the difficult construct that metacognition implies, according to Baker (1989), the main source of evidence for a person's metacognitive skills is constituted by the verbal reports that the person provides regarding post-experimental interview items or interrogations. However, both the interview and the post-experimental questioning techniques have been questioned, depending on the possibility of providing misleading information (Afflerbach, 1995). With regard to the interview, it is often the case that there is

no correspondence between what students say they would do and what they actually do. What should be done to overcome these deficiencies? It is recommended to collect data that do not only rely on verbal self-reports; it is possible, for example, to videorecord the execution and base the interview on relevant aspects observed in the recording (e.g. contrast behavioral evidence with verbal evidence, facial expressions and gestures).

The *verbal reports* referred to by Baker (1989) are constructed using the thought-aloud technique, which consists of making a person describe his thinking while he is thinking, inviting him to speak aloud as he resolves a certain problem; it is thought that when a person tries to describe what is going on in his head when he is thinking, more thoughts are raised in it. The basic purpose pursued in using this technique is to establish the degree of consciousness that the person has about his or her own thinking, that is, the strategies he or she uses to plan, monitor and evaluate their execution through the expressions that are emitted during the task's execution. Another way to collect metacognitive information is through the *stimulated memory*: in this case a 'retrospective questionnaire' is used (Rios, 1990), the purpose of which is to record the intellectual processes that the subject is aware of during the accomplishment of the task. By means of this questionnaire, the subjects answer a set of questions immediately after the task is completed. This instrument can be used to complement immediate introspection, that is, what the subject is aware of and expresses during the execution of the task, information that is obtained using the thought-aloud technique (Mateos, 2000; Recamán, 2006). Obviously, the different systems of evaluation, on their own, lack sufficient reliability to be considered absolute instruments based on the problems presented *per se* (Maturano, Soliveres and Macías, 2002). As a result, and as some authors indicate, when evaluating metacognition it would be convenient and advisable to use several methods that do not share the same sources of error (for example, responses to an interview and evaluation of an execution of a task). The data of the execution may or may not corroborate the verbal manifesto, and this can give us an idea of both the knowledge and the practice of the strategy that the person has used (Mayor, Suengas and González, 1993; Pozo, 2003; Martínez and Useche, 2006).

Highlighting limitations in the study of metacognition implies emphasizing that cognitive activity occurs in the mind but may not imply open and observable behaviors. Observable behavior represents the product but not the processes involved in the generation of that product (Van Zile-Tamsen, 1996). Despite the fact that self-reports are widely used methods to evaluate metacognitive activity, they have serious limitations, such as: (a) students may add issues that they interpret as desirable, regardless of whether they actually connect with cognitive activity; (b) students can interpret items in a variety of ways, so comparing their responses becomes very difficult; and (c) students may be engaged in metacognitive activities that are not being evaluated in self-reports, so our understanding of metacognitive processes is limited to the activities or tasks that are captured in the inventory (Pintrich, Smith, García and McKeachie, 1991). In addition to self-reports, however, the most frequently used methods of gathering such information are interviews and verbal reports (e.g. thought-aloud protocols) and, while not having the self-reports' limitations set out above, there is an issue that worries different scholars in the field: subjects may not be aware of their mental processes and/or may not be able to explain these processes to the investigator. In addition, verbalization may interfere with the process (Miranda-Casas, Acosta-Escareño, Tárraga-Mínguez, Fernández and Rosel-Remírez, 2005). Accordingly, and although there is currently no ideal method for evaluating metacognition (Livingston, 1996; Lopera, 2011), many researchers use a combination of the various methods in order to overcome the limitations that each one of them, individually, presents (Tobias and Everson, 1996).

Some closing thoughts

It should be noted that, while it is evident that metacognition emerges in the mainstream fields of education and cognitive psychology (Bruning, Schraw and Ronning, 1995; Rodríguez, 2009; Lopera, 2011), there are various topics that are raising more doubts within the research

community today, including the measure of metacognition and the definition of the construct, among others. There is a general agreement that they all need to be investigated more deeply, while not forgetting that, as investigators, the measure is the basis for all activity. Various authors, such as Tobias (1994) and Reder and Schunn (1996), consider that the measure of the construct is the weakest aspect of metacognitive research at present. In reality, this deficiency arises from two main problems: a poorly defined construct and excessive confidence in the measures of the self-report. Because the construct is poorly defined, innovative operations of metacognition can only be conjectured (Forrest-Pressley and Waller, 1984; Schraw, 1998). Specifically, the measures of metacognition in terms of a correct enumeration of a certain number of problem-solving strategies can measure the memory of a discussion and may have nothing to do with the cognition of the student in relation to actually solving problems (Schanenflugel, Moore and Carr, 1997). In addition, many studies that attempt to do more than measure knowledge have tried to do innovative metacognitive operations, such as asking students to verbalize their cognition while they are trying to perform a task, and codify the metacognition (for example, a student who says something like "Ah… this is where I was wrong last time" would be annotated as a metacognitive response). Unfortunately, the measures of the self-reports on cognition are remarkably problematic, since they assume that students (often young students) are aware of their cognition and their metacognition; they also assume that they are accurate and impartial observers of their own cognition and metacognition, and that they can point out their observations exactly (Van Biljon, Tolmie and du Plessis, 1999). Clearly, few subjects would validate these three premises, especially in the case of younger children, and in the case of self-reports of the use of previous strategies there are still more problems, since they are more difficult to prove. A research path that needs to be fully investigated is how to measure or evaluate the metacognitive activity of one or more valid forms (Biggs and Moore, 1999; Weinert and Rainer, 1987). As we do this, we also need to promote the development of metacognition, forming students who are more conscious and autonomous in their learning, more self-regulated in their

awareness of apprentices, and more motivated by that learning that constitutes the basis of life. We also need to form more students who are able to develop learning strategies, both cognitive and metacognitive. In doing so, we cannot forget the fundamental role that the teacher has in the process of 'teaching to learn' for his/her students, guiding them to an autonomy that leads them to 'learn to learn' (Pozo, 2003; Pozo and Postigo, 2000; Lopera, 2011) and encourages the transfer of their learning to their daily life.

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