

Measuring metacognitive strategies using the reading awareness scale ESCOLA

**Virginia Jiménez¹, Aníbal Puente^{1,2},
Jesús M. Alvarado^{2,3}, Lorena Arrebillaga¹**

¹ Dept. of Basic Psychology, Cognitive Processes II, Faculty of Psychology,
Complutense University of Madrid

² Institute of Biofunctional Studies, *Complutense University of Madrid*

³ Dept. of Behavioral Sciences Methodology, Faculty of Psychology,
Complutense University of Madrid

Spain

Correspondence: Virginia Jiménez Rodríguez. C/ Juan Álvarez Mendizábal, 60. 2º D. 28008 Madrid. Spain. E-mail: virginiajimenez@psi.ucm.es

© Education & Psychology I+D+i and Editorial EOS (Spain)

Abstract

Introduction. Current cognitive approaches highlight the importance of metacognition. “Learning how to learn” facilitates awareness of one’s own learning processes, how they work, how to optimize their functioning, control of reading process, and so on. Acquisition of these skills is one of the new educational requirements for students, as is recorded in many educational reform plans in Europe, North America and Latin America.

Method. The test includes 56 items that represent “reading situations”; each situation offers three alternatives from which the reader must make a choice. The option selected reveals how readers “perceive themselves” and “how they believe they would act” if faced with these dilemmas. Each option expresses a different degree of reading awareness. The test has been validated with Spanish and Argentine samples, making up a total sample of 684 students from ages 8 to 13 (375 Spaniards and 309 Argentines).

Results. Results indicate that the ESCOLA instrument can quickly and accurately gather information about a student’s level of reading awareness. Younger students have a lower level of reading awareness than the older students.

Conclusions. In addition to identifying students with low reading awareness, results obtained from ESCOLA make it possible to design specific intervention programs for metacognitive strategies in the area of reading. Currently there is no existing product with these features. Modern psychologists and educators consider that metacognitive training is a crucial aspect of developing reflection, autonomous learning and construction of knowledge on the part of teachers and students.

Keywords: Metacognition, self-regulation, cognitive strategies, planning, monitoring, evaluation, person, task, text, motivation, autonomous learning.

Received: 12/15/08

Initial Acceptance: 01/02/09

Final Acceptance: 04/27/09

Medición de estrategias metacognitivas mediante la Escala de Conciencia Lectora: ESCOLA

Resumen

Introducción. Los enfoques cognitivos actuales destacan la importancia de la metacognición. Se trata de “aprender a aprender” facilitando la toma de conciencia de cuáles son los propios procesos de aprendizaje, de cómo funcionan y cómo optimizar su funcionamiento y el control de los procesos de lectura, entre otros. La adquisición de estas habilidades es una de las nuevas exigencias formativas para los alumnos, según se recoge en muchas de las reformas educativas de Europa, Norteamérica y Latinoamérica.

Método. La prueba incluye 56 ítems que representan “situaciones de lectura” con tres alternativas, ante las cuales el lector debe tomar partido. La alternativa seleccionada permite conocer “cómo lo lectores se perciben” y “cómo creen que actuarían” ante los dilemas. Cada alternativa expresa un grado diferente de conciencia lectora. La prueba ha sido validada con muestras españolas y argentinas, compuesta por 684 estudiantes entre 8 y 13 años (375 españoles y 309 argentinos).

Resultados. Los resultados indican que ESCOLA es un instrumento que nos permite recoger información rápida y precisa del grado o nivel de conciencia lectora de los alumnos. Los alumnos de menor edad poseen un nivel de conciencia lectora menor que los de mayor edad.

Conclusión. A raíz de los resultados obtenidos en ESCOLA, además de identificar al alumnado con baja conciencia lectora, se pueden diseñar programas de intervención específicos en estrategias metacognitivas en el área de la lectura. Actualmente no existe un producto de estas características. Psicólogos y educadores consideran que el entrenamiento metacognitivo es un aspecto crucial del desarrollo reflexivo, el autoaprendizaje y la construcción del conocimiento por parte de los profesores y los alumnos.

Palabras Clave: Metacognición, Autorregulación, Estrategias Cognitivas, Planificación, Supervisión, Evaluación, Persona, Tarea, Texto, Motivación, Autoaprendizaje.

Recibido: 15/12/08

Aceptación inicial: 02/01/09

Aceptación final: 27/04/09

Introduction

Metacognition is the knowledge that people possess about their own cognitive processes and products and any other information relevant for learning (Flavell, 1976, p. 232). Some specialists consider it the “control center” of the cognitive system (Flavell, 1971, 1981, 1987; Flavell & Wellman, 1977; Mengelkamp & Bannert, 2009; Schraw, 1998). Brown (1980, 1987) offers a precise description which includes two related dimensions: knowledge and regulation of cognition. The first alludes to *what* we know about it and the second to *how* we regulate it.

The “what” has to do with declarative, procedural and conditional forms of knowledge (Brown, 1987; Jacobs & Paris, 1987). Declarative knowledge is knowledge about ourselves as learners and about factors that influence our performance (*what* we are learning). Procedural knowledge refers to knowledge of useful strategies for learning, memory, reading, etc. (*how* we go about learning skills). Conditional knowledge consists of knowing when and why to use a specific strategy. The “how” involves planning, monitoring and evaluation processes (Jacobs & Paris, 1987; Kluwe, 1987). Planning means selecting the right strategies, distributing resources, setting goals, activating knowledge, etc. Monitoring consists of regulation and self-assessment of skills needed to control learning. Evaluation is an assessment of the results and the learning regulation processes.

As children develop metacognitive processes, they internalize certain knowledge about three variables – knowledge that must be activated in order to reach cognitive goals (Garner, 1987; Mateos, 2001; Schneider & Pressley, 1989). The variables are person, task and strategy. The person variable enables them to differentiate their own mental processes from those of others, keeping in mind that there are elements common to both. Such knowledge is formed progressively and enables us at each moment to assess what we know and do not know, the degree of certainty, and the limitations of our knowledge about some thing or about ourselves.

Knowledge of the factors that define the task variable (scope, degree of difficulty, etc.) help us to determine or select solution procedures. Just as with the person variable, an understanding of this variable’s influence is also acquired progressively during the individual’s development. It is essential to understand the intent of each task since this knowledge helps us

choose the most appropriate strategy (Mayor, 1980). The strategy variable involves reflection on cognitive and metacognitive strategies that the subject uses (Forrest-Pressley & Waller, 1984; Lorch, Lorch & Klusewitz, 1993.) These procedures allow him or her to move from one situation to another, to relate one task to another and thus to meet objectives and goals; in short, they are solution procedures.

In addition to the processes and variables described above, some researchers acknowledge that self-regulated learning depends not only on cognitive factors but also on motivational factors (Burón, 1995; Mateos, 2001; Pintrich & De Groot, 1990). If cognitive factors relate to competency for carrying out a task, motivation factors have to do with task execution or performance. Weiner (1992), for example, considers that the students' attributions explain to a great extent their success or failure on a task. Thus, students who perceive themselves as effective learners and able to control their own learning are those who seek to learn and to master the task before demonstrating their competency to others in order to gain their approval. They have an intrinsic interest in the task, which they perceive as useful and meaningful, and they attribute their successes and failures to controllable factors such as the amount of effort applied to the task; consequently, they are likely to invest themselves in learning the task and to persist in the effort.

One value of assessing metacognition is to establish what tasks should be set in order for the reader to: a) Improve in those aspects where he or she does not meet the minimum required level; b) Learn new strategies or skills that facilitate assimilation of text content; c) Increase confidence in correctly completing certain reading tasks, and, d) Be more effective in study in terms of the time spent and the outcome achieved. Assessment procedures are not uniform for all cognitive activities. Just as in other areas of psychology, the techniques that may be used have certain limitations inherent to the theoretical assumptions and procedures involved (Pressley & Afflerbach, 1995).

One of the most-used techniques is based on verbal information offered by subjects during interviews, questionnaires, recorded entries and thinking aloud. The use of verbal reports as a methodological tool has been the object of many controversial analyses which question the reliability of the information, the experimenter's influence, the limited relationship between what the subject "says" he knows and what he actually "does". An often-repeated objection is that the procedure is not suitable for those subjects with limited linguistic devel-

opment, making it difficult for them to express their metacognitive experiences. In order to avoid such difficulties, certain precautions are recommended, for example: not asking about automatic processes which are inaccessible to reflection, reducing the time interval between processing and reporting, using indirect questions instead of direct questions in order to avoid biases, assessing the consistency of responses over time, etc. The *ESCOLA* Reading Awareness Scale (*Escala de Conciencia Lectora*), presented here, is a test which gets around some of these language difficulties without negatively impacting task execution.

Research in metacognitive development leads us to certain interesting conclusions. First of all, even the youngest students possess some limited amount of metacognitive knowledge (Baker, 1989; Pressley & Schneider, 1997). This knowledge improves performance, and furthermore it appears to be teachable even to small children (Buttler & Winne, 1995). Secondly, aptitude and knowledge limit metacognitive development to a much lesser extent than one might expect (Glenberg & Epstein, 1987; Pressley & Ghatala, 1988; Swanson, 1990). Thus, teachers should make the effort to provide metacognitive teaching to pupils who need it, regardless of their performance level, and not reserve such teaching only for more advanced pupils (Jacobs & Paris, 1987; Palincsar & Brown, 1984). Thirdly, tests shows that metacognitive awareness compensates for low ability and insufficient knowledge (Delclos & Harrington, 1991).

Although there is general agreement about the importance of metacognition, certain aspects that affect metacognition assessment continue to be the object of debate (Mayor, Suengas & González, 1995; Martí, 1995). A first critical aspect is the relative weight and importance that researchers assign to each of its components (Jacobs & Paris, 1987; Pintrich, Wolters, Baxter, 2000; Schraw & Impala, 2000). A second aspect is the degree of awareness which the subject must demonstrate before we can speak of metacognition. Regarding this point, we must consider the change from a conscious to an automatic state, giving rise to implicit regulated processes. A third controversial aspect refers to measurement procedures or techniques, and their relation to the specific domain which is being assessed (Saldaña & Aguilera, 2003).

The concept of metacognitive assessment is relatively new and complicated to approach, although in recent decades there have been efforts to develop suitable measuring instruments. We will offer a brief review of those instruments that may be considered direct

precursors of ESCOLA, and that find their roots in Paris and Jacobs (1984) and Jacobs and Paris (1987).

Paris and Jacobs (1984) take into account the following categories in their interview model for assessing reading awareness: a) assessment of the task and of cognitive skills involved, b) planning through the selection of actions that ensure fulfillment of the reading objective, and c) regulation and control of the cognitive effort. Although the interview made it possible to obtain an index of the subject's reading level development, certain problems were detected that had to do with subjects' linguistic competency (Garner, 1987). In order to resolve this issue, Jacobs and Paris (1987) developed the scale called Index of Reading Awareness (IRA), which made possible an objective estimation of metacognitive skills applied to reading processes and tasks.

McLain, Gridley and MacIntosh (1991) observed that the IRA only offered moderate levels of reliability and validity. These authors countered by developing a questionnaire known as the MRA (Metacognitive Reading Awareness), which collects information from the procedures that pupils use to remember and to solve reading difficulties. At the same time, Schmitt (1990) developed the multiple-choice MSI questionnaire (Metacomprehension Strategy Index) in order to measure reading awareness and strategic reading in elementary level children who were given a narrative text. Schraw and Dennison (1994) developed an instrument called Metacognitive Awareness Inventory in order to assess pupils' perception of their own metacognitive ability. More recently, Reading Strategy Use (RSU) by Pereira-Laird and Deane (1997) measures the perception of adolescents with regard to use of reading strategies with narrative and expository texts.

In recent years in Spain and Latin America, certain attempts have been made to formulate an objective procedure for metacognition measurement, as yet without a definitive result. One of these attempts comes from De Peronard, Velásquez, Crespo and Viramonte (2002). Recognizing the importance of metacognition (Carpio, 2002; Chadwick, 1985; Mayor et al., 1995; Paris & Winograd, 1990) and the absence of a standardized instrument in Spanish, we present ESCOLA as a test for assessing metacognition applied to reading processes and variables; this test addresses some of the problems analyzed previously and its theoretical framework is based fundamentally on the approach of Borkowski (1992), Brown (1987), Flavell (Flavell, 1987; Flavell & Wellman, 1977) and Schraw and Moshman (1995).

Method

Participants

The sample was formed by 684 students between the ages of 8 and 13, from third- to seventh-graders. Students who had been held back a year were included. Students came from both public and private schools, with 375 pupils from the Madrid metropolitan area and 309 from private schools in Buenos Aires (Argentina).

A stratified sampling technique was used in selecting the sample, taking into account both the sample size as well as how members were chosen. This method guaranteed that the sample selected would be equivalent to the population for which generalizations were being made. Immigrant students who did not master the language were excluded from the sample. Distribution by gender was similar to the following: 53% were boys and 47% were girls in both samples, with proportional representation of the social, economic and cultural strata.

Instruments

- Assessment of reading skills. Participating students' homeroom teachers were asked to complete an ad-hoc test that was drafted for this purpose; they were to assess pupils' ability in making summaries, reading aloud, spelling, vocabulary, strategies, etc. The scale was made up of nine items and each of these was scored on a scale of zero to four.

- Reading comprehension tests. Two texts were taken from the PROLEC-SE (Cuetos & Ramos, 1999): (A) *The eskimos* is a narrative text for group application, containing 338 words. After reading the text, students must answer 10 questions (5 literal and 5 inferential). The questions assess the amount of information that students have understood and remembered without having the text in front of them. (B) The second text, *Planet Áurea* assesses how students understand the structure of the text. As in the previous case, this is an expository text with 342 words. 22 words are left blank for the student to fill in (cloze technique), including 5 adjectives, 7 nouns, 4 verbs, etc.

- Metacognitive Awareness of Reading Strategies Inventory (MARSİ) by Mokhtari and Reichard (2002). The MARSİ test contains 30 items and was designed to assess readers' metacognitive awareness and their perception of strategies while reading school materials. The test has a factorial structure including the following factors: global reading strategies,

problem-solving reading strategies and support reading strategies. The MARSÍ global reading strategies have to do with a global analysis of the text. Problem-solving strategies refer to strategies used when the text is difficult to read. Support reading strategies relate to use of materials other than the text to help the reader understand what is being read.

– ESCOLA (Reading Awareness Scale) is made up of 56 items which present “reading situations”, or little dilemmas, as it were, where the reader must take a position. The readers' choices allow us to see how they perceive themselves and how “they believe they would act” in these situational dilemmas. Each of the dilemmas expresses a different level or degree of reading awareness. The objective was to build an instrument that would quickly collect accurate information about the degree or level of awareness, and that from this information effective strategies could be designed to improve reading skills in the educational setting.

ESCOLA combines items that incorporate processes, variables and strategic behaviors (See Appendix I). In its process assessment aspect, the test considers planning through items that measure the information search procedure, the reader's attitude to the test, the choice of appropriate reading strategies depending on the reading objective, the task requirement, and the type of text. Scale items which measure the Monitoring process refer to how the subject must adjust attention and effort (control) when addressing the reading task, his or her use of strategies for selecting relevant information from the text, perseverance and self-efficacy in understanding and controlling “reading tools” to help understand the text as well as to address difficulties that come up while reading, and how close he or she comes to meeting the goal. The Evaluation process is addressed through items that measure control of the reader's performance when faced with the reading task, verification of strategy appropriateness for the problems which arise in the reading task, and recognition of results obtained.

ESCOLA is based on the three processes described above, although it also assesses the variables of person, task and text. The Person variable corresponds to aspects such as: personal beliefs about the reader's level of knowledge both in terms of the text as well as the task to be performed, and the skill level and attributional styles that he or she possesses. The Task variable is a function of the reader's knowledge about the importance of the degree of task difficulty and of task ambiguity. The task objectives are also assessed, as well as all characteristics which affect greater or lesser difficulty. The Text variable involves text characteristics which influence comprehension and memory (Sánchez, 1990). Factors such as the ideas ex-

pressed by the text, vocabulary, syntax, author's intent, coherency, text structure, etc., are important for effective reading performance. Scale items measure the following aspects: difficulty in establishing differences between easy and difficult texts, awareness of this difference, identification of important elements, recognition of contextual limitations, recognition and importance of the structure and detection of anomalies and confusion.

Procedure

The procedure was developed in two phases. The first consisted of drafting the instrument and the second in analyzing its validity and reliability.

First phase: in order to draft ESCOLA, a set of items (150) were drawn up, taking into consideration the main components suggested by the theory. From the initial set, 56 items were selected which best represented the behaviors expected from a “good reader” (or strategic reader), taking into consideration judgments from a group of experts and the data obtained in a pilot study. The latter included 70 participating pupils between the ages of 9 and 13, from two schools, one public and one private. After a rigorous analysis of the information from the experts and the data given by the participants, problematic aspects were addressed in a second, improved version, now containing the 56 items of the final ESCOLA instrument (Puente, Jiménez & Alvarado, 2009).

Second phase: the instrument was subsequently examined for its validity and reliability with a broad national and international sample. To do so, scores from ESCOLA were compared to other corresponding reading measurements. A first comparison was carried out with a reading of the two PROLEC-SE texts (“The eskimos” and “Planet Aureo”) (Cuetos & Ramos, 1999). A second comparison used a Likert scale to be completed by the pupils' home-room teachers. This scale assessed aspects such as summaries, reading aloud, spelling, vocabulary, strategies, etc. It contains nine aspects and each of them was rated with a score from zero to four. Details of the instrument's validation and reliability are analyzed in the epigraph of the results. Finally, we administered the MARSÍ, a specific metacognition test which has been translated and adapted to the Spanish population (Alvarado, Puente & Jiménez, 2008), for the objective of analyzing the instrument's convergent validity.

Statistical analysis

Reliability and standard measurement error

Internal consistency of ESCOLA as measured by Cronbach's α yielded 0.81 for a sample including the Madrid pupils who completed the whole test and answered all items; for the Argentine pupils, the resulting value was 0.86. The lesser value obtained for reliability in the Spanish sample is due to older students (12 and 13-year-olds) generally reaching higher scores on the test, thus reducing the variance of the observed score. For this reason, when the second sample was taken, it was decided to lower the age of the subjects in both samples. Finally, if we take all the subjects as a single sample, internal consistency shows a value of 0.88.

Test reliability and standard measurement error were analyzed using Item Response Theory analysis; specifically, the information function was obtained by adjusting the data to the graded response model (Samejima, 1969), using the Multilog program (Scientific Software International). The information function (see Figure 1) shows higher values for the low and medium-low levels of the test. This result is highly pertinent in using the instrument, since the instrument's utility is for intervention in and improvement of metacognition, obviously more of a requirement for subjects that present low levels of this construct, in other words, precisely those subjects for which the measurement obtains its greatest levels of information and reliability.

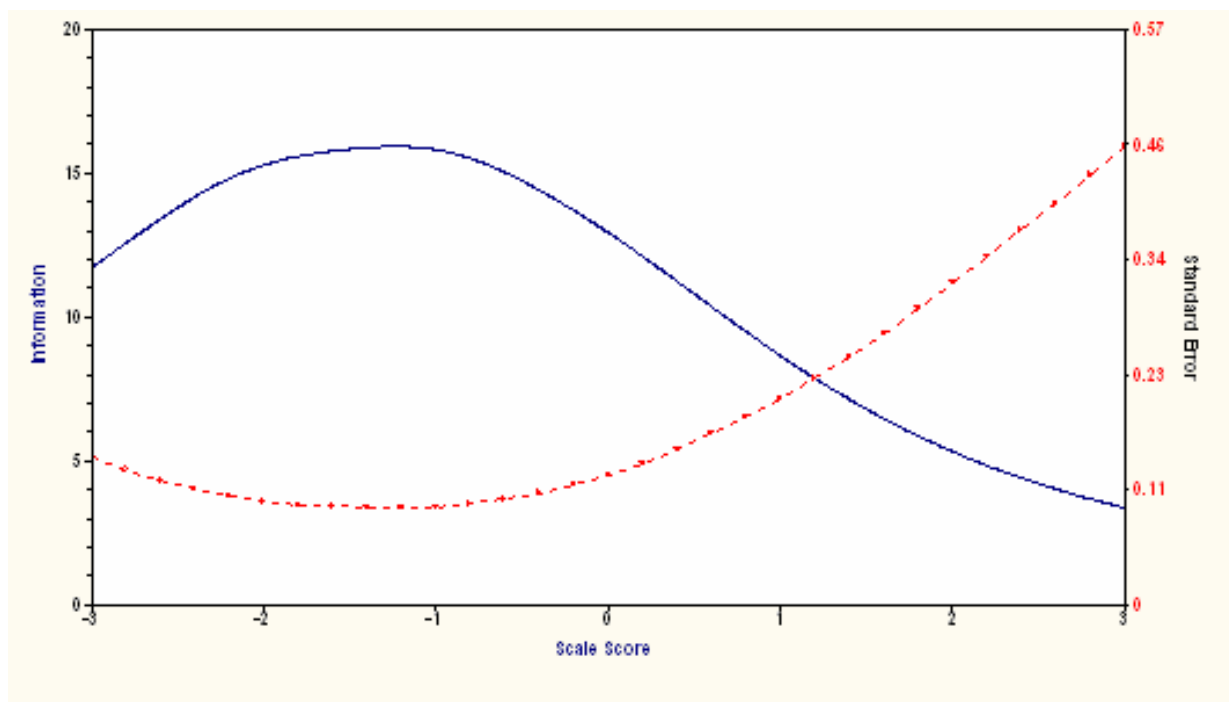


Figure 1. Information function of ESCOLA (solid line) and standard measurement error (dotted line).

Evidences of Content Validity

One of the objectives of the study was to ensure that the final test would adequately reflect both the structure and the content of the construct. The bulk of the work carried out with the experts committee and with the pilot study participants was oriented toward obtaining information and feedback on item formulation and other formal aspects of the instrument. The experts committee was made up of 9 teachers with a minimum of 15 years' experience and with specialized training in the area of reading and writing, and 3 university teachers with experience in drafting instruments for psychological measurement. The analysis confirmed the requirements needed for obtaining adequate content validity (representativeness, pertinence and relevance of items). Taking all this information into account, ESCOLA was finally organized in a matrix structure (3 x 3) combining three processes (planning, monitoring and evaluation) and three variables (task, person and text). A fourth variable called strategy (or strategic behavior) was distributed across all scale items as was the motivation component. The conceptual map presented below (Figure 2) expresses the nature of each item and offers a breakdown. (For a more exhaustive look at the components of the model, see the cluster analysis described in the doctoral thesis by Jiménez, 2004).

Measurement equivalence and differential functioning

In order to evaluate generalization of the test to different Spanish-speaking populations and cultures, ESCOLA was administered to a sample of Argentine schoolchildren in schools located in the city of Buenos Aires. Just as Multilog had been used for verifying the measurement equivalence of ESCOLA, the nine scale components were adjusted to a logical, two-parameter model, making it a requirement for the estimated parameters of the Spanish sample to have equivalence in the Argentine sample. Results showed good data fit to the model: $-2\log\lambda/g1 = 951/366 = 2.60$, by which it was concluded that the test can be generalized to other Spanish-speaking populations. Obviously, a more detailed analysis at the level of differential functioning (DIF) for the 56 items reveals linguistic particularities that recommend adaptation of certain more culturally-sensitive items in order to ensure more precise measurement (see Jiménez, Puente & Anibal, 2009).

Relation to other variables

In order to evaluate test validity, we collected both convergent evidences (positive relationships with other measures of the same construct), and discriminant evidences, showing that the construct differs from other similar but distinct measurements.

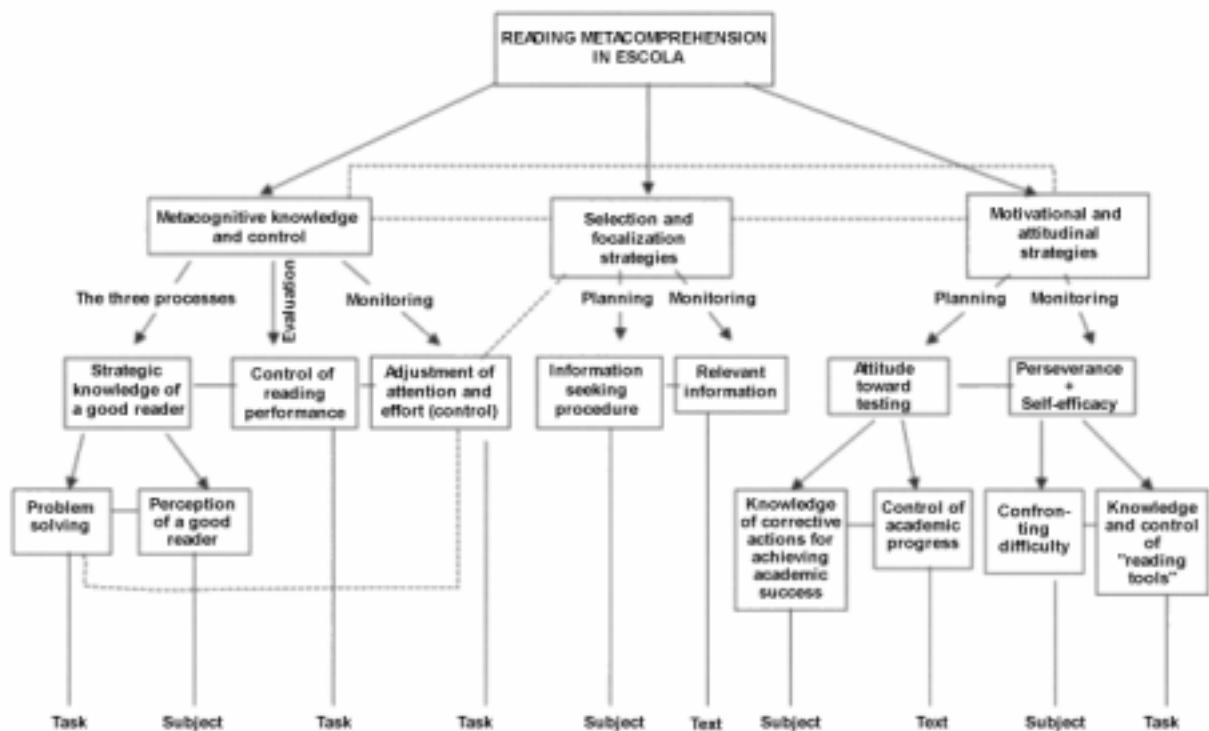


Figure 2. Conceptual map of ESCOLA based on cluster analysis

Discriminant evidence

Reading metacognition as we defined it in the introduction is obviously related to reading comprehension; however, a good measurement of metacognition should be capable of discriminating between the two measures.

In order to verify whether ESCOLA is distinguishable from reading comprehension tests, two reading comprehension subtests taken from the PROLEC–SE were used: one text with questions that students had to answer after reading, and a cloze procedure where students completed the missing words in the original text. The text explores the level of reading comprehension in its semantic aspects and the cloze looks into the syntactic domain and text structure.

Table 1 shows correlations of ESCOLA, with its different processes and variables, with test 1 (*The eskimos*) and test 2 (*Planet Áurea*) from PROLEC-SE.

Table 1. Correlations of ESCOLA with metacognitive processes and variables.

	ESCOLA	PLA PER	PLA TASK	PLA TEXT	MON PER	MON TASK	MON TEXT	EVA PER	EVA TASK	EVA TEXT
ESCOLA	1	.599**	.691**	.664**	.547**	.539**	.529**	.530**	.419**	.489**
TEST1	.140*	.118*	.065	.107	.115	.071	.052	.022	.084	.100
TEST2	.250**	.202**	.109	.123*	.155**	.137*	.007	.034	.091	.165**

Note: * $p < .05$. ** $p < .01$.

As seen in Table 1, ESCOLA shows a statistically significant, if not especially strong, correlation with test 1 (*The eskimos*). Text 1 is a narrative text followed by a series of questions; Cuetos and Ramos (1999) consider it an instrument for assessing reading comprehension, while ESCOLA is a scale for measuring reading strategies.

ESCOLA shows a somewhat higher correlation with Test 2 (*Planet Áurea*), which can be interpreted to mean that the strategic reader tends to perform better on cloze tasks (in order to respond suitably to Test 2, the main requirements are memory and certain prior knowledge, both of which are more likely to be well established in the strategic reader).

In summary, we consider that the significant but relatively low correlations between ESCOLA and the two tests are discriminant evidence between ESCOLA as a measurement of metacognition and PROLEC-SE as a measurement of reading comprehension.

Convergent evidence

Convergent evidence was obtained from two sources: a) through teacher judgments, and b) comparison with the metacognition test MARSÍ.

- Assessment made by teachers using a Likert scale, where they rated each pupil on the main aspects of the construct.

In order to evaluate the consistency of the teachers' assessments, samples were taken where the pupils were assessed by up to three different teachers. Results in Table 2 show that the teacher judgments were strongly correlated, presenting acceptable inter-rater reliability.

Table 2. Inter-rater correlations.

	Teacher 1	Teacher 2	Teacher 3
Teacher 1	1	.586**	.882**
Teacher 2	.586**	1	.590**
Teacher 3	.882**	.590**	1

Note: ** $p < .01$.

The correlations of teachers' judgments with the reading tests as well as with ESCOLA are shown in Table 3:

Table 3. Correlations of teacher judgments with the PROLEC-SE tests.

	ESCOLA	TEST1	TEST2
Teachers	.357**	.026	.170**

Note: * $p < .05$. ** $p < .01$

By observing the correlations in Table 3 we can conclude that what Test 1 measures is not what the classroom teacher looks at when measuring pupils' reading comprehension. However, there does appear to be more of a relationship with Test 2, such that we might suggest that the teacher pays more attention to text structure than to comprehension in the sense that it is understood by Cuetos and Ramos (1999). On the other hand, a correlation of 0.36 with ESCOLA was observed, being quite acceptable if we take into account that the teacher's assessment covered both metacognition aspects and other aspects related to comprehension and reading skill. Table 4 helps us understand what are the priority aspects for teachers when making their assessments.

Table 4. Correlations with basic aspects in teacher assessments of reading.

	PLA PER	PLA TASK	PLA TEXT	MON PER	MON TASK	MON TEXT	EVA. PER	EVA. TASK	EVA. TEXT
Profesores	.189**	.300**	.179*	.137	.174*	.110	.175*	.074	.355**

Note: * $p < .05$. ** $p < .01$.

The greatest correlations are seen with text evaluation (0.35) and task planning (0.30), which would be priority aspects for the teachers when making their assessments.

- Comparison of ESCOLA with the MARSİ Metacognition test.

A multiple regression analysis was performed in order to see what variance of the MARSİ measurement could be explained by ESCOLA. A sample of 150 school children were administered the two tests on successive days using a counterbalanced design, so as to avoid the effect of possible contaminating variables such as tiredness or the sequencing of the tests.

The multiple regression analysis shows that ESCOLA can explain 51% of the MARSİ variance, with a multiple correlation of 0.72. Nonetheless, a large part of the MARSİ variance (30%) can be explained with only seven ESCOLA items (13, 18, 28, 30, 35, 47 and 52), as can be observed in Table 5. The step regression showed that the fundamental aspects measured by MARSİ are monitoring and planning around the text.

Table 5. Step regression analysis: ESCOLA items in predicting the MARSİ.

MODEL	R	B	S.E. (B)	β	T
Step 1	0.28				
Mon.person (esc35)		4.59	1.40	0.28	3.28**
Step 2	0.36				
Mon.person		4.47	1.37	0.27	3.28**
Mon.text (esc47)		3.90	1.40	0.23	2.78**
Step 3	0.41				
Mon.person		5.01	1.36	0.31	3.74**
Mon.text		4.17	1.38	0.25	3.03**
Plan.text (esc52)		3.75	1.51	0.21	2.49*
Step 4	0.46				
Mon.person		4.55	1.35	0.27	3.38**
Mon.text		3.93	1.35	0.23	2.92**
Plan.text		4.42	1.49	0.24	2.96**
Mon.text (esc30)		5.43	2.01	0.22	2.70**
Step 5	0.50				
Mon.person		4.61	1.32	0.28	3.48**
Mon.text		3.42	1.35	0.20	2.54*
Plan.text		4.57	1.47	0.25	3.11**
Mon.text		5.32	1.98	0.22	2.69**
Plan.task (esc28)		4.56	2.00	0.18	2.28*
Step 6	0.52				
Mon.person		4.75	1.31	0.29	3.63**
Mon.text		3.16	1.33	0.19	2.37*
Plan.text		4.79	1.46	0.26	3.29**
Mon.text		4.67	1.98	0.20	2.36*
Plan.task		4.73	1.98	0.20	2.39*
Plan.text (esc13)		4.02	1.94	0.16	2.07*
Step 7	0.55				
Mon.person		4.29	1.31	0.26	3.29**
Mon.text		3.23	1.31	0.19	2.46*

Plan.text	5.00	1.44	0.27	3.49**
Mon.text	4.90	1.95	0.20	2.51*
Plan.task	4.06	1.97	0.16	2.07*
Plan.text	4.82	1.94	0.19	2.48*
Mon.text (esc18)	3.89	1.74	0.18	2.24*

Note: * $p < 0.05$ y ** $p < 0.05$

Construct validity evidences

Evaluation of the ESCOLA factorial structure and construct was carried out using the structural equation program LISREL (Scientific Software International). A principal components analysis indicates that a single factor explains 63% of the variance. Consequently, as indicated by the confirmatory factorial analysis (Figure 3), the test structure can be considered essentially uni-dimensional, with the following fit indexes: Goodness of Fit Index (GFI) = 0.97, Adjusted Goodness of Fit Index (AGFI) = 0.96, Root Mean Square Error of Approximation (RMSEA) = 0.12 and Standardized Root Mean Square Residual (SRMR) = 0.027.

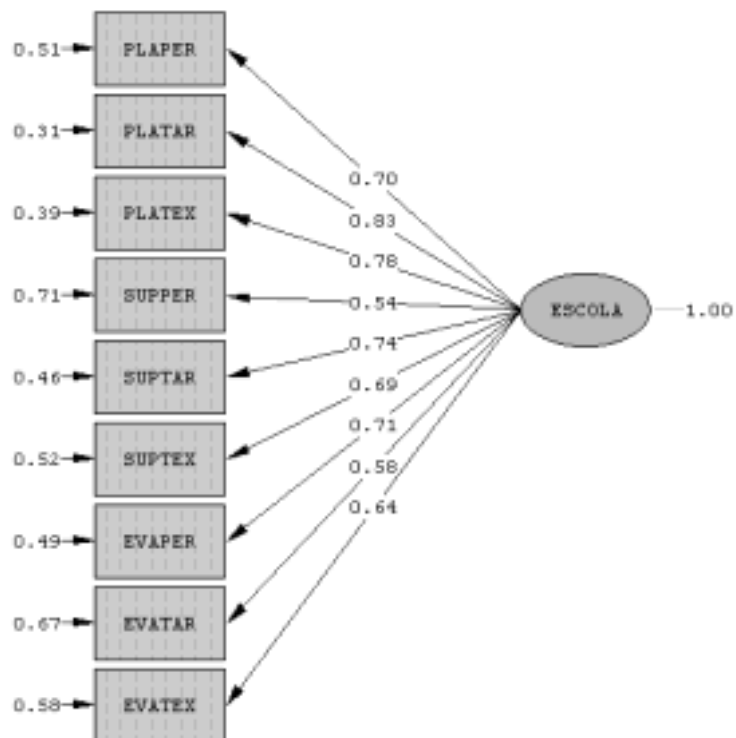


Figure 3. Strategic factor: unidimensional model of the ESCOLA

[Key: PLA-planning, SUP-monitoring, EVA-evaluation, PER-person, TAR-task, TEX-text]

Conclusions

Metacognitive assessment is an activity characterized by high gradation. Reflective awareness about what one “is doing or thinking”, understood as an intentional and internalized mechanism, has important implications for psychology and education. One of the central concerns is that teaching is to support students in carrying out reflective learning, such that they are able to use their knowledge in ever-changing contexts. From this point of view, metacognitive assessment is not an addition to teaching and learning, but it is integrated in the two, informing and guiding them.

Assessment in general is not a simple task, and in the particular case of metacognitive assessment it becomes a challenge full of uncertainties and difficulties. The central core of metacognitive assessment is not so much to determine how much declarative, procedural or conditional knowledge pupils possess, but to help them become aware of their learning processes, of what “they say they know” about how they learn, memorize, or read, about what they do and how they do it, in what specific situations to use a certain strategy, and what strategy to use in a completely different situation, being aware that a single strategy can be applied in similar situations and/or tasks (generalization of learning), etc.

When this knowledge is obtained, the reader can see his or her strengths and weaknesses, and this can help in the search for new, more efficient reading alternatives. None of this is possible if we have no tool with which to gain access to the internal, reflective world of the reader. For this reason we propose that the metacognitive component be treated as essential in new educational plans, to incorporate not only recent knowledge gained from research, but also the inclusion of workshops where readers learn to explain their learning processes, to describe their mental operations when faced with doubts and difficulties, to make judgments, to rate how well they meet objectives and how they build their knowledge.

ESCOLA is an instrument designed to measure metacognitive processes during reading, and as such, it has two objectives. The first, to evaluate how participants perceive themselves as readers and what strategies they believe are best for solving difficulties they may encounter hypothetically in the future. In order to complete the test, the children or adolescents must reflect on aspects such as: a) How effective am I as a reader (strengths/weaknesses), b) degree of difficulty of the task (easy/difficult), c) reconciling the

task and available resources (do I have enough resources for the task?), d) how I regulate and control the reading process (what strategies do I put into play), e) how I evaluate my own progress and the end-product of my reading.

Once the level of reading awareness has been assessed, the second fundamental purpose is the development of intervention programs at the group level as well as at the level of the individual. This second objective is the “driving force behind the project”. Diagnostic assessment is necessary as information that triggers something more important: preparation of materials and intervention workshops whose purpose is to promote and improve reading awareness and consequently to have positive repercussions on pupils' academic performance. It is well known that a large number of students are currently failing in their reading processes (see the PISA 2006 Report (MEC, 2007)); we therefore consider that creating a tool of this type will be beneficial for all such students. Some of the expected effects are direct and others indirect, though favorable in both instances. A proposed intervention (see Mourad, 2009) should include elements of training directed toward students (e.g. knowledge and regulation of strategies, how these can be developed, etc.) and other elements directed toward teachers (e.g., teaching strategies, modeling metacognitive behaviors, etc.).

References

- Alvarado, J.M., Puente, A. & Jiménez, V. (2008). Adaptación y validación del test de metacognición MARSÍ (Metacognitive Awareness of Reading Strategies Inventory) a muestras españolas. [Adaptation and validation of the MARSÍ metacognition test (Metacognitive Awareness of Reading Strategies Inventory) to Spanish samples.] (Document under development).
- Baker, L. (1989). Metacognition, comprehension monitoring and the adult reader. *Educational Psychology Review*, 1, 338-350
- Borkowski, J. G. (1992). Metamemory theory: A framework for teaching literacy, writing and math skills. *Journal of Learning Disabilities*, 25, (4), 253-257
- Brown, A. (1980). Metacognitive development and reading. In R. J. Spiro, B. C. Bruce & W. F. Brewer (Eds.), *Theoretical issues in reading comprehension* (pp.458-482), Mahwah, New Jersey: Erlbaum.
- Brown, A. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In E. Weinert & R. Kluwe (eds.), *Metacognition, motivation and understanding* (pp. 65-116). Mahwah, New Jersey: Erlbaum.

- Burón, J. (1995). *Motivación y aprendizaje*. [Motivation and learning.] Bilbao: Mensajero
- Buttler, D. L. & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research*, 65, 245-281
- Carpio, C. (2002). Intervención metacognitiva sobre comprensión lectora de personas con retraso mental. [Metacognitive intervention in the reading comprehension of mentally disabled persons.] *Siglo Cero*, 199. (January – February).
- Chadwick, C. (1985). Estrategias cognitivas, metacognición y uso de los microcomputadores en la educación. [Cognitive strategies, metacognition and use of microcomputers in education.] *Planiuc*, 4 (7). (January – June).
- Cuetos, F. & Ramos, J. L. (1999). *PROLEC-SE. Evaluación de los procesos lectores en alumnos de tercer ciclo de educación primaria y educación secundaria obligatoria*. [PROLEC-SE. Assessment of reading processes in pupils of higher-level primary education and compulsory secondary education.] Madrid: TEA Ediciones.
- Delclos, V. R. & Harrington, C. (1991). Effects of strategy monitoring and proactive instruction on children's problem-solving performance. *Journal of Educational Psychology*, 83, 35-42.
- Flavell, J.H. (1971). First discussant's comments. What is memory development the development of? *Human development*, 14, 272-278.
- Flavell, J.H. (1976). Metacognitive aspects of problem solving. In B. Resnick (Eds.), *The nature of intelligence*. Hillsdale. N.J.: Erlbaum.
- Flavell, J.H. (1981). Cognitive monitoring. In W.P. Dickson (Eds.), *Children's oral communication skills*. New York: Academic Press.
- Flavell, J.H. (1987). Speculations about the nature and development of metacognition. In F. Weinert & R. Kluwe (Eds.), *Metacognition, motivation and understanding*. Hillsdale: LEA.
- Flavell, J.H. & Wellman, H.M. (1977). Metamemory. In R.V. Kail Jr. & J.W. Hagen (Eds.), *Perspectives on the development of memory and cognition*. Hillsdale. N. J.: LEA.
- Forrest-Pressley, D.L. & Waller, T.G. (1984). *Cognition, metacognition and reading*. N.Y.: Springer-Verlag.
- Garner, R. (1987). *Metacognition and Reading Comprehension*. Norwood. NJ. : Ablex.
- Glenberg, A. M. & Epstein, W. (1987). Inexpert calibration of comprehension. *Memory and Cognition*, 15, 84-93.
- Jacobs, L. L. & Paris, S. G. (1987). Children's metacognition about reading: Issues in definition, measurement, and instruction. *Educational Psychologist*, 22, 255-278.

- Jiménez, V. (2004). *Metacognición y comprensión de la lectura: Evaluación de los componentes estratégicos (procesos y variables) mediante la elaboración de una escala de conciencia lectora (ESCOLA)*. [Metacognition and reading comprehension: Assessment of strategic components (processes and variables) through development of a reading awareness scale (ESCOLA).] Madrid: *Complutense* University of Madrid.
- Kluwe, R. H. (1987). Executive decisions and regulation of problem solving. In F. Weinert & R. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 31-64). Mahwah, New Jersey: Erlbaum.
- Lorch, R. F.; Lorch, E. P & Klusewitz, M. A. (1993). College students' conditional knowledge about reading. *Journal of Educational Psychology*, 85, 239-252.
- Martí, E. (1995). Metacognición. Entre la fascinación y el desencanto. [Metacognition. Between fascination and disenchantment.] *Infancia y Aprendizaje*, 72, 9-32.
- Mateos, M.M. (2001). *Metacognición y educación*. [Metacognition and education.] Buenos Aires: Aique
- Mayor, J. (1980). La comprensión del lenguaje desde el punto de vista experimental. [Language comprehension from the experimental point of view.] *Revista Española de Lingüística*, 10, 1, 59-111.
- Mayor, J.; Suengas, A.; y González, J. (1995). *Estrategias metacognitivas*. [Metacognitive strategies.] Madrid: Síntesis.
- McLain, K. V., Gridley, B. & McIntosh, D. (1991). Value of a scale used to measure metacognitive reading awareness. *Journal of Educational Research*, 85, 81-87.
- MEC (2007). *PISA 2006. Programa para la Evaluación Internacional de Alumnos de la OCDE. Informe Español*. [PISA 2006. OECD Programme for International Student Assessment.] Madrid: MEC.
- MEC (2006). *LOE. Ley Orgánica de Educación*. [Constitutional Law of Education.] Madrid: MEC.
- Mengelkamp, C. & Bannert, M. (2009). Judgements about knowledge: Searching for factors that influence their validity. *Electronic Journal of Research in Educational Psychology*, 17, 7(1), 163-190.
- Mokhtari, K. & Reichard, C. A. (2002). Assessing student's metacognitive awareness of reading strategies. *Journal of Educational Psychology*, 94, 2, 249-259.
- Mourad Ali, E. (2009). The effectiveness of a program based on self-regulated strategy development of the writing skills of writing-disabled secondary school students. *Electronic Journal of Research in Educational Psychology*, 17, 7(1), 5-24.

- Palincsar, A. S. & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1*, 117-175
- Paris, S. G. & Jacobs, J. E. (1984). The benefits of informed strategies for learning: A program to improve children's reading awareness and comprehension. *Journal of Educational Psychology, 76*, 1239-1252.
- Paris, S. G. & Winograd, P. (1990). Promoting metacognition and motivation of exceptional children. *Journal of Remedial and Special Education, 11*, 7-15.
- Pereira-Laird, J. A & Deane, F. P. (1997). Development and validation of a self-report of reading strategy use. *Reading Psychology: An International Journal, 18*, 185-235.
- Peronard, M., Velásquez, M., Crespo, N. & Viramonte, M. (2002). Conocimiento metacognitivo del lenguaje escrito: Instrumento de medida y fundamentación teórica. [Metacognitive knowledge about written language: an instrument of measure and its theoretical foundations.] *Infancia y Aprendizaje, 25* (2), 131-145.
- Pintrich, P. R. & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*, 33-40.
- Pintrich, P., Wolters, C. A. & Baxter, G. P. (2000). Assessing metacognition and self-regulated learning. In G. Schraw & J. C. Impara (Eds.), *Issues in the measurement of metacognition* (pp. 43-97). Lincoln, NE: Buros Institute of Mental Measurements, University of Nebraska-Lincoln.
- Pressley, M. & Afflerbach, P. (1995). *Verbal protocols of reading: the nature of constructively responsive reading*. Hillsdale, NJ: Erlbaum.
- Pressley, M. & Ghatala, E. S. (1988). Delusions about performance on multiple-choice comprehension test items. *Reading Research Quarterly, 23*, 454-554.
- Pressley, M. & Schneider, W. (1997). *Introduction to memory development during childhood and adolescence*. Mahwah, New Jersey: Erlbaum.
- Puente, A. Jiménez, V. & Alvarado, J. M. (2009). *Escala de conciencia lectora (ESCOLA). Evaluación e intervención psicoeducativa de procesos y variables metacognitivas durante la lectura*. [Reading Awareness Scale (ESCOLA). Psychological assessment and intervention in metacognitive processes and variables during reading.] Madrid: EOS.
- Saldaña, D. & Aguilera, A. (2003). La evaluación de los procesos metacognitivos: Estrategias y problemática actuales. [Assessment of metacognitive processes: Current strategies and problem areas.] *Estudios de Psicología, 24* (2), 189-204.

- Samejima, F. (1969). Estimation of latent ability using a response pattern of graded scores. *Psychometrika Monograph Supplement*, 17.
- Sánchez, E. (1990). Estructuras textuales y procesos de comprensión: Un programa para instruir en la comprensión de textos. [Text structures and comprehension processes: An instructional program in text comprehension.] *Estudios de Psicología*, 41, 21-40.
- Schmitt, J. T. (1990). A questionnaire to measure children's awareness of strategic reading processes. *The Reading Teacher*, 43, (7), 454-461.
- Schneider, W. & Pressley, M. (1989). *Memory development between two and twenty*. New York: Springer-Verlag
- Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science*, 26, 113-125
- Schraw, G. & Impala, J. C. (2000). *Issues in the measurement of metacognition*. Lincoln, NE: Buros Institute of Mental Measurements. University of Nebraska-Lincoln.
- Schraw, G. & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, 19, 460-475.
- Schraw, G. & Moshman, D. (1995). Metacognitive Theories. *Educational Psychology Review*, 7, (4), 351-371.
- Swanson, H. L. (1990). Influence of metacognitive knowledge and aptitude on problem solving. *Journal of Educational Psychology*, 82, 306-314
- Weiner, B. (1992). *Human motivation, metaphors, theories and research*. London: Sage.

APPENDIX I

ESCOLA is a combination of items that encompasses processes, variables and strategic behaviors. Presented below are some examples of questions which correspond to each of the categories, and which were used as a basis for drafting multiple-choice items for ESCOLA:

PLANNING - PERSON:

- Why are you going to read this text?
- Do you think you will be able to understand it? Why?
- Do you think you will learn “something” once you have finished the reading?
- Are you able to read with “noise”, or do you concentrate better if you are alone and don't have distractions around you?

PLANNING - TASK:

- How do you intend to do the reading? Quickly, just reading the underlined or highlighted parts? Slowly, in order to reflect on all the information that you can draw out? Do you think that doing a quick or a slow read depends on the time you have to read it?

PLANNING - TEXT:

- After reading the title, what do you think the reading is going to talk about? Have you ever read anything about this topic? Do you remember what it was? Does it seem interesting? Why?
- Why do you think your teacher wants you to read this text?

MONITORING - PERSON:

- When you are reading, if you find a word, expression or paragraph that you don't understand, do you know what you can do?

- Halfway through the reading, stop and ask: can you venture some idea of what will happen in the reading after what you have read so far?

– If you get distracted during the reading, do you know why? Do you know how to solve the problem?

MONITORING - TASK:

- Ask yourself questions aloud as you go through the reading (write them down in the margins if you need to). This will help you not to get distracted and it will encourage your concentration.

- Search for ideas as you read and not for words. It will help you understand the text better.

MONITORING - TEXT:

- When you observe the drawings/illustrations, do you think they help you understand the text better? Why?

- Do you think it is interesting that some words in the text appear in italics or underlined or in bold? Why?

EVALUATION - PERSON:

- What other class subjects do you now have that you could relate this reading to? Which subject do you like most? Why?

- Did you like the reading? Why?

- What did you learn?

EVALUATION - TASK:

- Are you able to tell aloud, in your own words, what you have just read?

- With the reading in front of you, make an outline; then explain the reading aloud, looking only at the outline.

- Can you answer the questions that you proposed in the previous process (MON-TASK)?

EVALUATION - TEXT:

- Write down another title for this reading
- Invent a different ending for this reading.
- Make a written summary of the reading.
- Cloze text, in narrative style, or as a conceptual map: “Fill in the blanks.”
- Prepare a questionnaire about the text that was read, but only show the pupil the answers, so that he or she can write the questions.