Procedure for Evaluating Self-regulation Strategies during Learning in Early Childhood Education

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ABSTRACT:

Introduction. The evaluation of learning strategies is assigned great importance due to its link to academic performance, as found in recent research. Our intent in this paper is to describe both results obtained as well as to detail the procedure we used to evaluate self-regulation strategies used in the execution of a mathematics/logic task.

Method. This evaluation was carried out at three points in time (before, during and after the task); at each time information was obtained as to four large strategy types (metacognitive, cognitive, support and dexterity). A total of 24 students participated, all of them in their final stage of Early Childhood Education in a public school in Almeria (Spain). Interviews were adapted for age and recorded by means of a protocol specifically designed for this purpose.

Results. A lack of metacognitive strategies is found before task execution. During task execution the most used strategy is the search for information using questions. After task execution few subjects justify their activity through cognitive or metacognitive aspects. We find that strategic profiles correlate with cognitive performance. ANOVAS indicate that the type of execution marks differences in performance, in the total number of strategies used and in the types of learning and self-regulation strategies.

Discussion. In general, we find a significant lack of metacognitive strategies, coherent with the pupils' developmental level, though this may be partially compensated for by use of other cognitive and dexterity strategies at certain moments in execution. We likewise find use of support strategies during task execution.

KEYWORDS: Learning strategies, self-regulation, evaluation procedure, early childhood education, learn to learn.

INTRODUCTION

In the field of academic research, learning strategies have been the object of differing consideration, according to the authors and the era. Thus, after an extended period of behavioral predominance in which any process not directly observable fell outside any research interest, we move to cognitive-constructivist focuses where the concept of learning becomes an active mental process, constructive and self-regulated. That is when we can find, among the assertions most accepted by researchers and practitioners in education, an affirmation that learning means, among other things, acquiring a repertory of cognitive and metacognitive strategies (Jones, Palincsar, Ogle & Carr, 1987).

On the other hand, while some authors understand deficits in strategies and techniques as problems which exist in addition to other difficulties, other authors take them as a category within learning difficulties of a temporary or transitional nature. In any case, the study of improvement in self-regulation strategies for learning is a field of great current interest (Boekaerts, Pintrich & Zeidner, 2000; De la Fuente, 1998; De la Fuente y Justicia, 1998; De la Fuente & Martínez, 2000; De la Fuente, Amate, Gómez & Martínez, 2000; García, De la Fuente, Justicia *et al.*, 2003). Thus it is quite accepted that the lack of self-regulation strategies in learning leads to a poorer learning process and poorer performance (Zimmerman, 2000; Zimmerman & Kintasas, 1997; Zimmerman & Martínez-Pons, 1998).

At the social level, consideration and treatment of this problem is equally apparent as it has been assigned much relevance in recent years (newspaper *"El País"* 25/2/2002–Education Supplement[1]). The increasing proliferation of councils directed toward instruction in learning strategies and techniques is, without a doubt, a clear example of this. In the educational context, and in response to this growing interest and ever-increasing evidence of a close tie between learning strategies and academic performance, it seems necessary to put effective procedures for evaluating students in the use of such strategies at the disposition of educators throughout the various educational stages. However, evaluation of learning strategies has been insufficiently applied in our schools to date, especially in Early Childhood Education. This circumstance is due, among other reasons, to the indirect nature of procedures used to get at the strategic behavior of students, such as is the case in using reference systems like

[1] In this issue we find an article where the experts explicitly relate the lack of learning strategies and academic failure. For more detail, we refer the reader to the webpage *www.geocities.com/eoilinaresaprenderaleman/aelpais.html*, where you may consult this article in its entirety.

language or the observation of displayed behavior (Monereo, 2001). This methodological difficulty is even more acute in the case of children in early childhood education (Mañas, 1997).

The current article, prompted by the above considerations, has three basic objectives. First, to describe strategies that early childhood education students use during different phases of completing a mathematics activity --strategies evidenced through use of a questioning process which we developed as an evaluation tool-- and to classify these strategies into strategic profiles. Second, to establish relationships between the characterizations of each profile and performance on the task. Finally, to determine educational implications for optimizing the teaching-learning process.

METHOD

Subjects

The sample subjects were selected by a random procedure. There were a total of 24 five-year-old subjects, all of them belonging to the same group at the same level of Early Childhood Education in a public school in downtown Almeria. The proportion between the sexes was balanced (12 boys and 12 girls).

Design

In the quasi-experimental designed used, we defined different variables to study:

1) *Learning strategies*. We take the design by De la Fuente (2001) as a model, being a further development from a previous version (De la Fuente and Martínez, 2000), and so distinguish three main times at which students apply their strategies in a self-regulated fashion: before, during and after the task. Based on an earlier model by Cano and Justicia (1996), thie one also considers the existence of three large groups of strategies: cognitive, metacognitive, and those supporting processing. In addition to these we include dexterity skills, considered as the child's focalization of thought on his dexterous activity at any of the before-mentioned points in time. Thus, at each time in the activity we did an analysis of the strategy types that the child showed he was using.
2) *Student performance*. Observed level of task execution, including its different aspects.
3) *Strategic profile of the students.* While this research was underway, we defined four different profiles as a function of the strategies put into practice and the moment when used. These strategies, which are described in the next section, are: non-strategic

execution centered on dexterity, non-strategic execution centered on imitation of the model, strategic execution not maintained during task completion, and maintained strategic exeuction.

Procedure

1. *Constructing the evaluation protocol*

Starting from the previous conceptual model, and in order to arrive at a definitive evaluation protocol, we performed a pilot study in advance with a different sample of 25 students from other groups with analogous characteristics. Each answer was categorized as an answer condition according to the recording protocol that will be described in subsequent sections, until a high reliability index among the three participating investigators was reached. Refer to this summary-chart of all the answer categories that we found following the pilot stage and the later field stage.

2. *Task selection*

Regarding task selection, we simply call to light the importance of previous reflexion on the task requirements and characteristics in order to assure ourselves that it will reveal the information we wish to obtain. For that reason, we would evaluate aspects such as previous knowledge required for its execution, type and number of cognitive operations (counting, comparing, observing, etc.) that must be put in play during its resolution, etc. In this case, we used a procedure for cognitive task analysis (De la Fuente, 2001), where three independent judges assessed the intrinsic difficulties therein. This procedure proved useful for our purposes, though a detailed description is outside the scope of this paper. Finally, the task selected was considered to fall within medium difficulty, per the curriculum of this age group. As can be seen in the illustration, the task consists of drawing in the balls needed so that all trees would have the same number as the model.

SCANNED WORKSHEET (see end of article)

3. *Procedure and criteria for evaluating performance*

Global performance on the task was obtained by an arithmetic mean between the performance valued at a cognitive level and performance valued at a dexterous level. Both were obtained in turn by a procedure among judges, when first a consensus was reached about the specific criteria for each case (chart 2).

CHART 1

Based on the model of interrogative evaluation of self-regulation strategies
(De la Fuente, 2001).

TIME I: BEFORE TASK EXECUTION

Planning (instruction: *"tell me how you're going to do it")*:

- Dexterous skills (e.g. *"color the balls"...).*
- Cognitive strategies (e.g. *"compare it to the model"...)*:
  - Comparing exclusively the relative positions.
  - Comparing quantity.
- Metacognitive strategies (e.g. *"thinking", "pay attention to"...).*

Awareness (instruction: *"what do you think is the most important thing about this worksheet?")*:

- Gives no answer or similar.
- Focused on dexterity aspect (e.g. *"color inside the lines"*...).
- Focused on central aspects of the task (e.g. *"count"*...).
- Awareness of the importance of metacognitive strategies (e.g. *"think"*...).

TIME II: DURING TASK EXECUTION

- Dexterous skills (*"says what s/he does"*).
- Cognitive strategies:
  - Execution of cognitive processes (*counts, compares...*).
  - Spontaneous revision.
- Metacognitive strategies (*"says what s/he is thinking or what s/he is doing at a cognitive level"*):
  - Focusing on dexterous actions
  - Focusing on the main objective.
  - Focusing on support strategies.
  - Looking for information.
  - Prior organization.
- Processing support strategies:
  - Self-stimulation (e.g. *"It's almost done!"*...).
  - Expression of positive and negative attitudes and feelings (e.g. *"I don't like it"*...).

TIME III: AFTER TASK EXECUTION

Self-assessment (instruction: *"How did it turn out?"*):

- Good.
- OK.
- Bad.

Justification (instruction: *"Why?"*):

- Justification in the main objective of the task (e.g. *"I counted"*...).
- Justification alluding to metacognitive aspective (e.g. *"I thought"*...).
- Justification based on dexterity aspect (e.g. *"I colored outside the lines"*...).

CHART 2

Scale for assessing students' performance on the task.

ASSESSMENT CRITERIA

a) AT THE DEXTERITY LEVEL:

- Not leaving blank spots (uncolored).
- Not going out of the lines.
- Doing it completely, that is, not leaving any elements uncolored.
- Drawing in the missing balls (in the case that she or he did so).
  - Correctly drawn with the hook detail...1 point
  - Correctly drawn without the hook detail...0,5 puntos
  - Not drawn or poorly drawn...0 puntos

☞ The presence of these criteria will be valued at a maximum of one point each.

Maximum score: 4 points.

b) AT THE COGNITIVE LEVEL:

- 0 points... Absence of cognitive manifestation (there is just coloring).
- 2 points... Indications of cognitive processing (position-model).
- 4 points... Signs of adequate cognitive processing
- Maximum score: 4 points.

At no time were the subjects' identities revealed during the evaluation process. The researchers who acted as judges of the task executions were independent of those that developed the field work, this way assuring impartiality in the latter and a null impact of preconceived ideas in their deliberations.

4. *Definition of strategic profiles*

As noted early, while the research process was underway, we defined four strategic profiles as a function of certain patterns or regularities observed in students when using certain types of strategies at specific times, profiles we would later relate to the student's performance on the activity, as observed at two levels: cognitive and dexterous. These profiles are:

- Profile 1: *Non-strategic execution centered on dexterity:* Here we group together those students that, especially before task execution, did not show any strategic behavior toward its resolution, and they focused their attention especially on the dexterous aspects of the task.
- Profile 2: *Non-strategic execution centered on imitation of the model:* These students, like in the previous group, did not show strategic behavior, but unlike those in profile

1, they emphasized the importance of copying the model, investing most of their efforts in this. This aim, in actuality, was not in line with the objective of the task.

- Profile 3: *Strategic execution not maintained throughout execution:* This typology implies a qualitatively important advance with respect to the previous ones. In this case, students have a clear awareness of the activity and of planning it before execution. What characterizes this case is that this awareness becomes lost during the activity.
- Profile 4: *Strategic execution maintained:* Finally, these students show a strategic attitude in their repertoire throughout the task.

Techniques and instruments

We can highlight the following techniques and instruments used for evaluating learning strategies:

1. The main technique used was the individualized interview of a semi-open nature. This interview, as we made clear in the procedure section, was perfected by means of a previous pilot until we achieved a question format clear enough to facilitate that the children's verbalizations addressed precisely the questions we sought to evaluate. At the same time, the pilot served to give us a range of possible answers that we might expect in our subject samples, thus contributing to the definition of categories for the instrument. Once the final format of the interview was agreed on, it was not significantly altered in application from one subject to another. On the other hand, the interview did have two well-differentiated formats in accordance with the time the information was being collected. In this sense, *before* and *after* the execution refers to a more delimited question-answer format while, in contrast, *during* the execution process the interview took on a much freer form through use of the popular *"microphone game"*. This game consists basically in asking the child to tell aloud (simulating speaking into a microphone) all that he or she is thinking or doing during task execution. In this case, the child's descriptions of his or her actions and/or thoughts were also complemented with observation for strategy evaluation of this particular point of time. The latter technique has been used earlier for similar studies with small children (Medrano and Herrero, 1996).

2. During the study, an instrument was designed based on the times and variables already specified; this acted simultaneously as protocol for the interview and as a record of the students' answers. This instrument is composed of a quadrant structured according to 3 general times of strategic execution: before, during and after. At each of these times, one can find the strategies described in square 1 for its recording. As protocol we provided the literal formulas of the conservations to be held with the children, determined through the procedure explained earlier, in order to avoid biases. See appendix 1.

Data analysis

The data collected were subjected to descriptive, correlational and inferential analyses, using the program SPSS for Windows (v. 9.0).

RESULTS

Results are grouped along two lines. First, we seek to enumerate the strategies most significantly used by the students in our sample. Second, we also seek to make evident the link between consistent patterns in the use of said strategies – "*strategic profiles”*– and performance on the proposed activity.

1. *Descriptive evaluation of strategies used during task realization*

Following the system described above, students' answers were categorized as a function of their nature, per the strategy types underlying each of them. Likewise, we consider the time at which the strategic response occurred within task execution (before, during or after) according to the theoretical model assumed (see table 1).

TABLE 1

Percentage of self-regulation strategies used by the students (n=24). Types are indicated: mc=metacognitive, c=cognitive, d=dexterity, s=support.
The highest values are marked with *.

1) At start of task:	Yes	No
** Awareness of the activity:*		
1. Thinking, paying attention to the activity (mc)	25.0	75.0*

2. Counting, comparing the numbers... (c)	58.3	41.7
3. Drawing, coloring... (d)	37.5	62.5
* *Planning the activity*:		
4. Thinking, paying attention...(mc)	20.8	79.2*
5. Comparing the model with the position of the balls (c)	70.8*	29.2
6. Counting, comparing the number of balls on each tree with the model (c)	41.7	58.3
7. Coloring the parts already drawn: balls, trunk, leaves, etc.(d)	70.8*	29.2
2) During task fulfillment:		
8. Previous organization: says before doing(mc)	29.2	70.8*
9. Says what is thinking (mc)	12.5	87.5*
10. Says what is doing (mc)	29.2	70.8*
11. Cognitive execution: counts, compares, etc. (c)	8.3	91.7*
12. Information search: asks (c)	54.2	45.8
13. Task revision: checks number of balls(c)	16.7	83.3*
14. Positive, encouraging self-instruction (s)	20.8	79.2*
15. Self-induction of expectations of success(s)	20.8	79.2*
3) On finishing the task:		
16. Metacognitive reasons: having thought....(mc)	29.2	70.8*
17. Cognitive reasons: having counted, compared...(c)	12.5	87.5*
18. Dexterity reasons: not coloring outside, drawing well ...(d)	100.0*	00.0
19. Expectations of execution (s)	91.7*	8.3

As could be expected given their developmental stage, the children in general show a sharp lack of strategies of the metacognitive type at the first point in time (before). Thus, for example, during the planning stage, when asked by the researcher to say how he or she is going to do it, only 20.8% of the children make any allusion to any kind of previous planning (e.g. *"first I am going to think"*, *"to look at"*, etc.). This can explain in part why only 41.7% of the children later choose from among their resolution strategies the one which is most appropriate to the task requirements. Something similar occurs at the point of awareness.

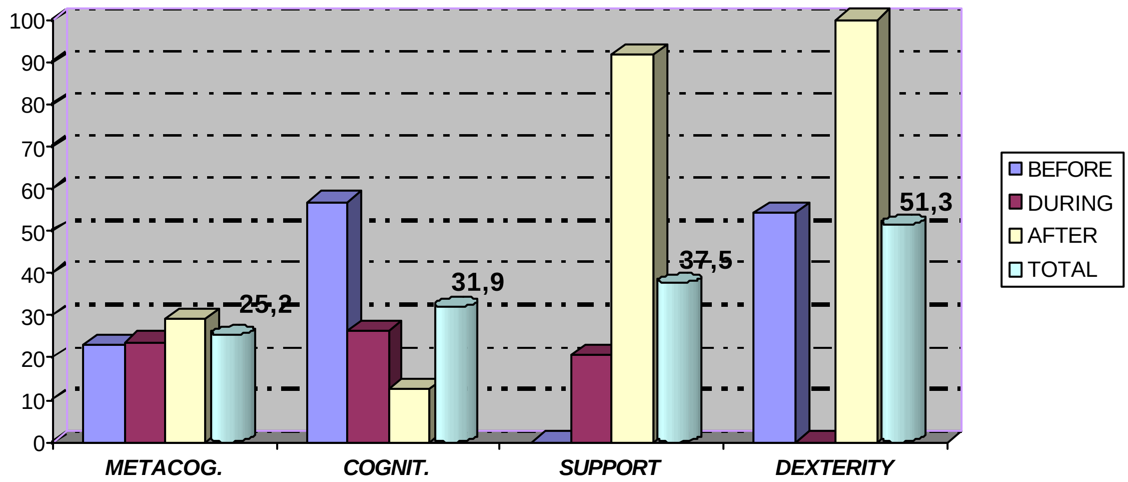
At the second point in time (during execution), we find little use of strategies. At this point, the most frequent strategy is searching for information through questions (54.2%). Very few children talk about what they are thinking at a given moment, and also very few spontaneously review the steps that they are taking.

At the last point (after), there are very few students who justify their task completion in terms of cognitive or metacognitive aspects (e.g. having counted or having thought, respectively). In this sense, there exists a marked tendency to focus especially on dexterity aspects (not coloring out of the lines, not leaving blank spots, etc.).

We present these same data in the following chart where one can observe even more clearly the evolution of strategy use at each point in task execution (before, during, and after).

FIGURE 1

Strategies used by the students, noting their type and times of use.



Observe once again the predominance of dexterity-type strategies over other strategies, especially over those of metacognitive type, followed by the cognitive type and processing support, respectively.

Similarly, we can assert the preponderance of cognitive and dexterous strategies at the first time, as well as processing support and dexterous strategies at the last time.

2. *Strategic profile of the student and relationships with performance observed during the task*

To begin, we can assign the number of subjects which fall into each of the previously-defined profiles (see procedure). For the sample being studied, the number of students found in profile 4 (maintained strategy) formed 12.5% of the total (n=3), as compared to 29.2% that fall into each of the earlier profiles (n=7).

Having made this observation, and in order to relate student task performance to the strategic profile characterizing him or her, we decided to utilize correlational analysis techniques. These yield the following significant data:

TABLE 2
Matrix of correlations between profile and different types of performance (n=24).

	PROFILE	DEXTERITY PERFORMANCE	COGNITIVE PERFORMANCE	TOTAL PERFORMANCE
PROFILE				
DEXTERITY PERFORMANCE	0.193			
COGNITIVE PERFORMANCE	0.570**	0.177		
TOTAL PERFORMANCE	0.562**	0.539**	0.924***	

** The correlation is significant at level 0.01 (bilateral).
*** The correlation is significant at level 0.001 (bilateral).

As seen in the correlations matrix, the strategic profiles correlate very significantly ($p < .01$) with cognitive and total performance shown by the students on the task. The sense of the correlation is favorable to profile 4, while profile 3 shows similar performance to 1 and 2. Notwithstanding, this significance is not noticeable with regard to dexterity performance.

An interesting secondary aspects is, for example, the existence of a higher level of self-criticism in profile 4 students. This might lead us to hypothesize that strategic students are probably more demanding of themselves when self-evaluating, possibly due to a higher consciousness of the *"true requirements of the task"* and their possibilities of taking it on successfully, as compared to the rest of the students' perception of success justified by the *"subjective requirements"* of the task.

3. *Students' strategic profiles and differences associated with them*

The following statistical effects are reflected from results of the different Manovas and Anovas carried out, taking as dependent variable the type of execution:

TABLE 3

Types of students, strategies used and performance on the activity (n=24).

type	n	average (sd)	F partial,p< post	F total,p< Pillai Trace
		total strategies:		
1	n=7	1.31 (.11)		F(3.23)=7.57 ***
2	n=7	1.30 (.13)		4 > 3,2,1 **
3	n=7	1.31 (.15)		
4	n=3	1.60 (.20)*		
		type of strategies:		
		metacognitive:	F(3.20)=0.513	F(12.57)=4.441 ****
1	n=7	1.12 (.12)		
2	n=7	1.20 (.16)		
3	n=7	1.22 (.24)		
4	n=3	1.23 (.17)		
		cognitive:	F(3.20)= 351.35 ****	
1	n=7	1.19 (.20)	4 > 3,2,1 ****	
2	n=7	1.00 (.00)	3 > 2,1 ****	
3	n=7	1.50 (.00)		
4	n=3	1.94 (.12)*		
		dexterity:	F(3.20)=3.92 *	
1	n=7	1.82 (.23)	2>3*	
2	n=7	1.92 (.12)		
3	n=7	1.53 (.26)		
4	n=3	1.75 (.25)		
		support:	F(3.20)= 3.44 *	
1	n=7	1.14 (.24)	4 >3 *	
2	n=7	1.07 (.18)		
3	n=7	1.00 (.00)		
4	n=3	1.50 (.50)*		
		self-regulation strategies:		
		at the start:	F(3.20)=11.409****	F(9.60)=5.602 ****
1	n=7	1.28 (.15)	4 >1,2 **	
2	n=7	1.40 (.18)	3 > 1**	
3	n=7	1.54 (.12)		

4	n=3	1.61 (.15)*	
		during:	F(3.20)=10.591****
1	n=7	1.22 (.12)	4 >3,2,1 ***
2	n=7	1.17 (.18)	
3	n=7	1.15 (.16)	
4	n=3	1.56 (.20)*	
		at the end:	F(3.20)=0.952 ns.
1	n=7	1.82 (.12)	
2	n=7	1.89 (.13)	
3	n=7	1.78 (.12)	
4	n=3	1.83 (.14)	
		performance on the activity:	
		total:	F(3.23)=28.17 ****
1	n=7	0.96 (.36)	4 > 3,2,1 ****
2	n=7	1.92 (.49)	2 > 1,3 **
3	n=7	1.14 (.34)	
4	n=3	3.25 (.25)*	
		cognitive:	F(3.23)=39.83 ****
1	n=7	0.00 (.00)	4 > 3,2,1 ****
2	n=7	1.71 (.75)	2 > 1,3 ****
3	n=7	0.28 (.75)	
4	n=3	4.00 (.00)*	
		dexterity:	F(3.23)=0.560 n.s.
1	n=7	1.92 (.73)	
2	n=7	2.14 (.55)	
3	n=7	2.00 (.76)	
4	n=3	2.50 (.50)	

* p<.05 ** p<.01 *** p<.001 **** p<.0000

Again results show that "*type of execution*" is an independent variable that marks significant differences, not only in performance, but in different dependent variables analyzed, such as the total of strategies used, the types of learning strategies and the self-regulation strategies. However, the type of execution does not delimit differences in the use of metacognitive strategies, nor in strategies used to finalize the activity.

In conclusion, we can affirm that the *"maintained strategic"* type of execution is superior in the majority of variables analyzed. As a consecuence, students with this type of execution are significantly superior in the use of cognitive and support strategies, even if the same is not true of metacognitive and dexterity strategies. He or she is also superior in the use of self-regulation strategies in learning, especially at the point of beginning or carrying out a task, as well as in total performance and in cognitive performance.

DISCUSSION

Through this research effort, we believe we have contributed a procedure relatively simple to apply in the classroom, and based on a previous model for evaluating learning strategies in early childhood education. It can be used in classroom evaluation, something which has been developed only minimally due to the inherent difficulties in this type of research.

As for results, regarding our first objective we highlight the significant predominance of dexterous and cognitive strategies over the metacognitive, as to be expected given the age of the subjects. Similarly, it is interesting to take note of the time when these are put into practice (more at the beginning than during the activity). It is likely that this is due to attention being focused more on task resolution at the time when it is being carried out, and not so much on saying what one is doing or thinking at each moment.

Likewise, after classifying subjects in four, clearly differentiated strategic profiles, we note the overwhelming predominance of the three first models (non-strategic execution centered on dexterity, non-strategy execution centered on imitation of the model, strategic execution not maintained during task execution) with respect to the last (maintained strategic) – 87.5% compared to a mere 12.5%.

All these data seem to confirm the inexistence of a stable, deliberate repertoire of learning strategies in students associated with this study. This could be due to, among other reasons, the actual developmental characteristics of children this age, or, more interestingly from an educational psychology perspective, the absence of a model of strategic teaching that favors and encourages training and development in these types of invaluable strategies, not only instructional or academic, but probably also personal and social. As a data point to defend this supposed relationship between the use of one or another strategy type and the pedagogic model, let us not forget the emphasis the children give to dexterity aspects, aspects that just happen to receive priority attention on the part of teachers of this age group.

For all the above, we feel not only that strategic teaching is possible, but also desirable. In this sense, it is our intention –as well as a personal and professional challenge– to set forth in the next section some general guidelines for action.

EDUCATIONAL IMPLICATIONS

After observing over the course of this study the undeniable importance of self-regulated use of strategies during learning, we offer some *"brushstrokes"* of what –to our way of seeing– should constitute general pillars of a strategic focus in a coherent teaching process. This approach, as Cano and Justicia (1996) advise, may mark the future of education during this new millennium.

First, we warn that a complete model of strategic teaching should be incorporated in all sectors and areas of the educational system: from the administrator to the teacher. Otherwise, we may fall into the illusion of changing our usual practices without those changes constituting more than a partial attempt –perhaps even becoming counterproductive– at educational innovation. Thus we highlight the two following points as being vitally important:

- *Teacher training.* Currently both initial training programs and ongoing teacher development are oversaturated with conceptual and disciplinary content, and the occasional theoretical content in the area of didactic or psychological knowledge. In most educational systems, there is nothing in either the training processes or the selection processes to guarantee that a teacher will be more or less strategic, or that he or she will know more or less about strategies, not to mention that such strategies are not even considered as content area to be taught. We encourage training that should lead the teacher to reconceptualize his or her functions: *the teacher does not teach, but rather helps to learn*, since it is evident that to get strategic students we need strategic teachers who are conscious of the complex cognitive, metacognitive and motivational processes put into play for learning (Monereo, 1993). A teacher is trained specially to be strategic, and from there to design strategic educational models. In this sense we agree with Nisbet

(1991, p.231) when stating that: *"we cannot expect teachers to know how to teach thinking if they themselves do not think"*.

- *The academic curriculum.* This curriculum should move from being a collection of known items to be considered a compendium of abilities and procedures that it expects to develop in the students. These abilities are precisely those that should give structure to the curriculum and around which different types of content are ordered (Pérez Cabaní, 1997). In the case of a mathematics task, for example, this would mean that the important part is not knowing how to solve a certain algorithm correctly, but rather how to find the way to solve it. One prioritizes, then, the means over the end, if we may so express it. The current regulatory framework [in Spain] leaves the door open in this sense by incorporating procedural content in the different sets of required minimums.

The next question arising from this approach is *What type of strategies are best to teach?* We think that, in order to be educational and useful, they must possess a series of characteristics, from which we may sketch out the following:

Adequate to the students' level. It is obviously essential that strategies being addressed in a certain group agree with the subjects' ability, and with their level of previous knowledge in terms of their own strategies and the context in which these are intended to be used. We have shown that, from the first stage of schooling, students already possess certain signs of strategic learning that, logically, differ substantially both in quality and quantity from those used at other stages of their schooling. To diagnose just how adequate is a given strategy for a group or for a specific student is the task of the teacher who wishes to be strategic.

Adaptive. This means that they will serve the future citizen to be adapted to his social environment and, why not say so, to his academic environment, with the characteristics, potentialities and limitations that we currently recognize in school. From this we derive, for example, that a certain strategy is useful to teach to fifth-year students in a certain town, and is not useful for students of the same level in another town. Its adaptability has repercussions on its functionality, and this in turn on its significance and relevance with regard to learning. Closely related to this is the strategy's potential for being *transferred* to multiple contexts to which the child has daily connections. His *apprehension* depends to a good degree on this generalization.

That is addresses the interests of the child and his or her needs at the time. When a content's significance is relegated to medium/long term, it is unlikely to be *apprehended* with any guarantee of its enduring through time. Precisely this *persistence* should constitute another fundamental criterion for deciding how useful it may be to incorporate a strategy in our teaching program.

Learning-oriented, not (only) performance-oriented. We can differentiate those strategies which only help to attain more success at school or in society (performance strategies) from others that, more generally, help learning and are guided by an intrinsic motivation (learning goals). Due to the usefulness of both, we feel that schools should teach both types of strategies, given that the one type (learning strategies) claims a higher educational benefit, and the other (performance strategies) are essential for the subject's socialization, and even more when it comes to evaluating characteristics of current society.

As to how we approach the teaching-learning process from a strategic viewpoint, we must --as a preliminary-- make a general premise which we were mentioning earlier: strategies should not constitute an isolated entity or a body of knowledge apart from traditional disciplines, but rather, on the contrary, from an *interdisciplinary perspective***,** they should be worked in in a totally integrated fashion within the normal teaching program. The use of one or another strategy –and its benefits– cannot be disconnected, not even for didactive purposes, from the context in which it acquires its relevance and significance. Apart from this, we can distinguish two fundamental ways to handle this dimension in classroom instruction, that is: the conception of strategies as a content area to be instructed, or, as a means for learning other curricular content areas. Neither of these cases contradicts at all the principle of curricular insertion which we alluded to earlier, since, in the first case, one understands that strategies are worked on in order to approach specific tasks and not general ones. Perhaps the second idea is somewhat more assimilated, at least in non-university education, where teachers may find the unavoidable need to recur to *"little tricks"* to get their students to catch on to certain content items.

Regarding *teaching techniques***,** we must consider *explicit teaching* as something complementary to other ways of approaching a strategic teaching-learning focus, as long as the previous specific conditions are respected.

Nonetheless, we think that the best way to teach strategies –as with other content types– is by example. For that reason, *modeling* –based on principles of learning by imitation as developed in papers by Bandura– is not only necessary, it becomes indispensable. This technique supposes that the teacher will model the entire procedure involved in execution of a certain task, at a metacognitive, cognitive and dexterous level. The technique's main potential with respect to acquiring strategic knowledge, according to Monereo (2000), is in the explicitation of not only "what you do" but also "why you do it". Similarly, the student's explicitation of internal processes carried out during a certain activity results in a *shaping* process. This *shaping* is a progressive sequencing of learning and strategy use that may contribute notably to strategy acquisition.

Finally, in spite of its being implicit in some of the earlier points, we do not want to end here without a brief reference to evaluation, since, whether we like it or not, it constitutes an essential element when giving shape to the teaching-learning process. The *evaluation* of this whole model must be coherent with the qualities that have inspired it. To that end, we believe it inherent to set forth an assessment that helps us understand the process and not only –as we commonly find– the final product. This seems obvious since otherwise we could not evaluate the use of all those strategies which are not directly observable –perhaps the most relevant ones. In this effort we can use diverse and varied techniques among which we emphasize observation, self-reporting, and the interview. It is thus purposeful that our research and strategy evaluation model are based largely on these.

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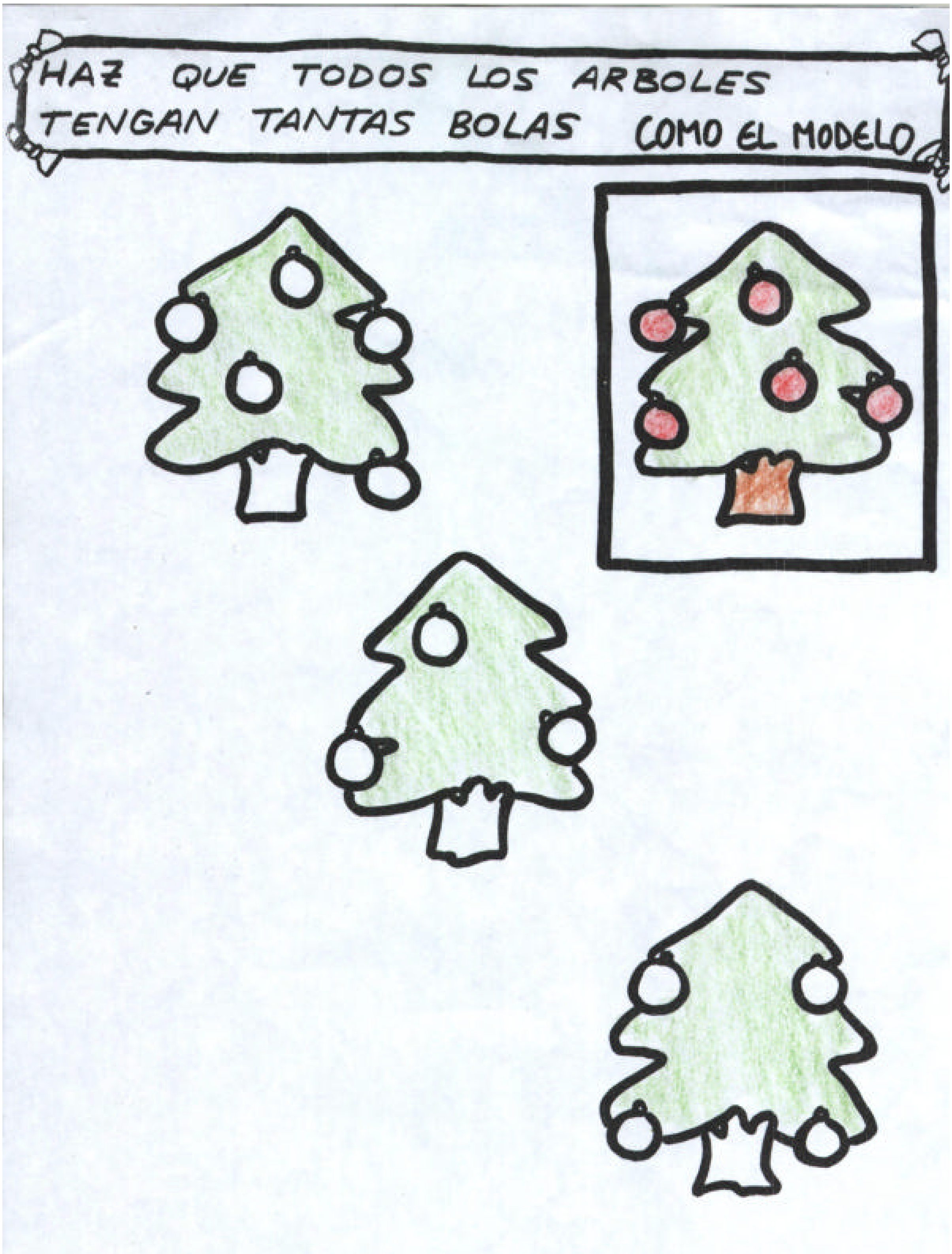
Scanned worksheet:



Translation: "Make all the trees have as many balls as the model."

ATTACHMENT 1: *Protocol-Record of Evaluation*

ADAPTATION DIALOGUE (to achieve a relaxed and communicative atmosphere)

TASK PRESENTATION (prior activities)

In this task you have to make all the trees have as many balls as the model.
Now I´m going to give you some time to think about how you should do it. (30 seconds are given.)

Tell me how you're going to do it.

Coloring parts already drawn (balls, trunk, etc.)	Comparing the position of the balls with the model	← Thinking, paying attention ... →	Counting, comparing the number of balls on each tree with the model

What do you think is most important? What do you think I want you to learn?

I don't know / Persistently silent or centers the objective on circumstantial aspects	Dexterous aspects: *drawing, coloring...*	← Thinking, paying attention ... →	Central aspects: *counting, comparing, numbers, ...*

TASK EXECUTION (activities during)

In order to do this worksheet we are going to play the microphone game, do you know how it goes?...
Tell us what you are doing and thinking while you do the worksheet, OK?...

Prior organization aspect (tells before doing)	Information search (asks)	Self-stimulation. (e.g.Almost done!)	Attitude and feelings (e.g. I'm tired, I don't like it, etc.)		Dexterity aspects (tells what s/he "is doing")	Metacognitive aspects (tells what s/he "is thinking" or doing at a cognitive level.)			Cognitive aspects (counts, compares, ...) but without saying so	Spontaneous revision (double checks when finishing the number of balls)
			-	+		Dexterity	Support	Objective		

AFTER THE TASK

How did it turn out?

Good	OK	Bad

Why?

Justification based on the real objective of the task (e.g. having counted, compared, thought,...)	← Because I thought, I paid attention to... →	Justification based on dexterity aspects (e.g. coloring outside or not, leaving blank spots or not, ...)

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