ACTA DIDACTICA NAPOCENSIA

Volume 4, Number 4, 2011

PRIMARY SCHOOL TEACHERS' SELF-REGULATED LEARNING SKILLS

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Abstract. Self-regulated learning (SRL) skills are very important in problem solving. It is important to strat to develop these skills from the first years of school. Thus, it is essential that primary school teachers master self-regulated learning skills and they know how to develop these skills in their pupils. In this article, we present the results of a research made among 31 primary school teachers regarding their self-regulated learning skills. The tool is a questionnaire developed specially for this purpose. This questionnaire has 19 questions, 16 items are related with the topic of the research and they are affirmations, which have to be evaluated by the respondents on a 5-point Likert scale: from 1- not at all typical for me to 5 – totally describes me. We have formulated the affirmations based on the theory of SRL. The results show that the respondents' problem analyzing and help-seeking skills are low, but their self-monitoring skills are good. When analyzing the problem, only one third of the respondents rephrases the text of it and makes drawings for a deeper understanding. The respondents has good self-monitoring skills, almost two third of them check if the solution is correct and three quarters of the teachers check if they have used all the data of the problem. The respondents help-seeking abilities are low, only less then half of them are searching for similar worked examples and one third of them ask for the help of a colleague in case of an insuccesful problem solving. These results emphasize the necessity of developing primary school teachers' problem solving and self-regulated learning skills.

Keywords: self-regulated learning, primary school teachers, mathematics education, problem solving.

1. Introduction

Mathematics education has changing over the last decades. Nowdays developing problem solving skills are more important than aquiring mathematical knowledge. Teachers who can't adapt to these changes probably will produce students who can only use the learnt rules, formulas, or methods (Ernest, 1988). One reason why is difficult for the teachers to change their teaching style is that they may lack the pedagogical skills or/and confidence to adapt to these changes (Gregg, 1995). Many teachers feel unable to be innovative in their teaching (Gratch, 2000). Another reason is that they are tempted to use teaching methods similar to those of their own teachers (Brown, Cooney & Jones, 1990). The third reason is that teachers' beliefs about mathematics and their perspective on mathematics influence their teaching style. "One's conception of what mathematics is affects one's conception of how it should be presented. One's manner of presenting it is an indication of what one believes to be most essential in it. (Hersh, 1986, p. 13) Two teachers with similar mathematical and pedagogical knowledge could teach differently depending what they think important: the mastery of notions, formulas, methods and procedures or "the continually expanding field of human creation and invention" (Ernest, 1988, p. 93). The fourth reason is that there are strong evidences that primary school teachers lack mathematical sophistication (Brown, Cooney & Jones, 1990). They should be more open to challenging mathematical problems and they should develop their problem solving skills. Self-regulated learning skills are important for problem solving.

Received 28 May 2011.

Self-regulated learning (SRL) is a form of learning, through which the learner sets goals and makes plans before starting to learn; monitors and regulates his/her cognition, motivation and behavior during the learning process; and then reflects on his/her learning process and outcomes (Pintrich, 1995; Pintrich, 2000; Zimmerman, 2001). SRL skills are important in mathematical problem solving, thus they have to be developed starting from early years.

A teacher with problem solving and self-regulated learning skills are more likely to adopt the principles of the theory of SRL in their teaching practice in order to increase their pupils' motivation for learning mathematics and their performance. Students' interest in mathematics, their beliefs in the utility of the mathematical knowledge in their everyday life determine influence their problem-solving behavior. Primary school teachers should have a positive attitude to mathematics in order to increase the motivation of their students.

The aim of this article is to study primary school teachers' self-regulated learning skills.

2. Self-regulated learning skills

Self-efficacy has an important role in SRL, it is one's perception on his/her capability to perform a task (Bandura, 1997). "People's beliefs in their efficacy influence the choices they make, their aspirations, how much effort they mobilize in a given endeavor, how long they persevere in the face of difficulties and setbacks, whether their thought patterns are self-hindering or self-aiding, the amount of stress they experience in coping with taxing environmental demands, and their vulnerability to depression." (Bandura, 1991, p. 257) Primary school pupils' self-efficacy is usually high (Bandura, 1986), believes on their capacity become more accurate and stable over time (Bandura, 1997). The teacher has to be careful to protect children from continual failures; these could contribute to a negative self-perception.

Students' interest in mathematics, their beliefs in the utility of the mathematical knowledge in their future career or in their everyday life determine in a fundamental way their problem-solving behavior. „Belief systems are one's mathematical world view, the perspective with which one approaches mathematics and mathematical task. One's beliefs about mathematics can determine how one chooses to approach a problem, which techniques will be used or avoided, how long and how hard one will work on it, and so on." (Schoenfeld, 1985, p. 45) There is a link between students' attitudes and their achievement in mathematics (Schoenfeld, 1989; Mc Leod, 1992; Brown et al. 1988), thus developing a positive attitude towards learning mathematics is important. This interest for studying mathematics has to be developed by the teacher. Thus, teachers' beliefs about Mathematics play a major role in developing their teaching practice, and consequently influence not only their pupils' attitudes and interests, but also their self-efficacy and achievement (Philippou & Christou, 1998; Tschannen-Moran & Hoy, 2000).

Self-control and self-monitoring of the cognitive strategies, motivation, and behavior are also important. While solving mathematics problems "control has to do with the decisions and actions undertaken in analyzing and exploring problem conditions, planning courses of action, selecting and organizing strategies, monitoring actions and progress, checking outcomes and results, evaluating plans and strategies, revising and abandoning unproductive plans and strategies, and reflecting upon all decisions made and actions taken during the course of working on a problem." (Lester et al., 1989, p. 4)

Self-judgment is one's evaluation on his/her performance and recognition of the relationship between the achieved performance level and the quality of the learning process (Zimmerman, 2000). Thus self-regulated learners attribute their poor performance to lack of effort or time; or to the use of an inadequate strategy (Zimmerman, 1998). Students who attribute success to effort and failure to lack of effort are more likely utilize strategies with which they have experienced the success (Borkowski, Weyhing & Turner, 1986).

Self-reaction involves feelings about the achieved results: satisfaction or dissatisfaction (Zimmerman, 2002). When students feel satisfaction about their performance, they are more motivated to complete the task (Schunk, 1991). The teacher has to be aware that mathematics is a difficult subject for many

students, thus the feeling of satisfaction is important for developing a positive attitude towards learning mathematics.

Self-regulation is important in problem solving, thus developing SRL skills and teaching of mathematics are in strong relation. Mathematical problem solving according to the principles of SRL and incorporating the self-regulated mathematical problem solving model (Marcou & Lerman, 2006) can increase students' task value, intrinsic goal orientation beliefs, and performance (Marcou & Lerman, 2007).

3. Research

3.1. Research design

Aim of the research

The aim of the research is to study primary school teachers' self-regulated learning skills.

Tool of the research

The main tool of the research is a questionnaire developed for evaluating primary school teachers' self-regulated learning skills. The first 3 items are demographic questions, the next 16 items are related with the topic of the research and they are affirmations which have to be evaluated by the respondents on a 5-point Likert scale: from 1- not at all typical for me to 5 – totally describes me. The affirmations are formulated based on the theory of SRL. Cronbach's alpha reliability for the test is .0.814.

Sample of the research

The questionnaire was anonymously filled in by 31 primary school teachers during January-February 2011. All of the respondents are females which can be explained by the fact that in the system, there are only few male primary school teachers.

More than one third of the respondents (36%) are between 31 and 40 years old, 23% between 41 and 50 years old, 19-19 % less than 25 years old respectively between 25 and 30 years old (see Figure 1).

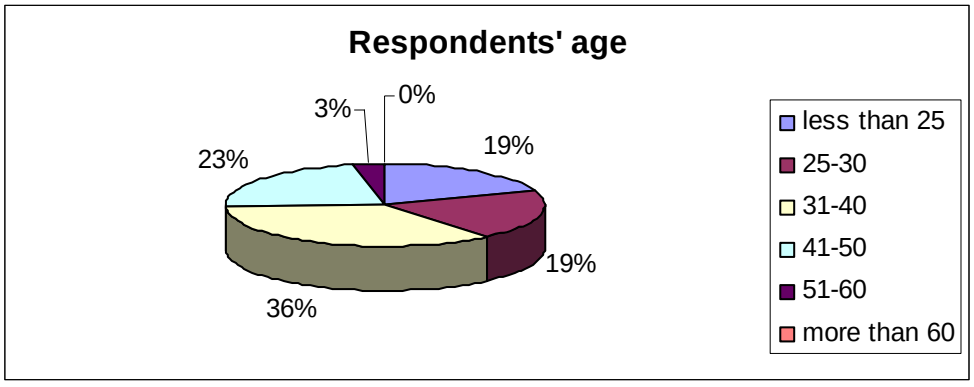

Figure 1. Respondents' age

Almost one third of the teachers (28%) have between 11 and 15 years of teaching experience, 26% between 2 and 6 years, 16% between 16 and 25 years of experience (for more details see Figure 2).

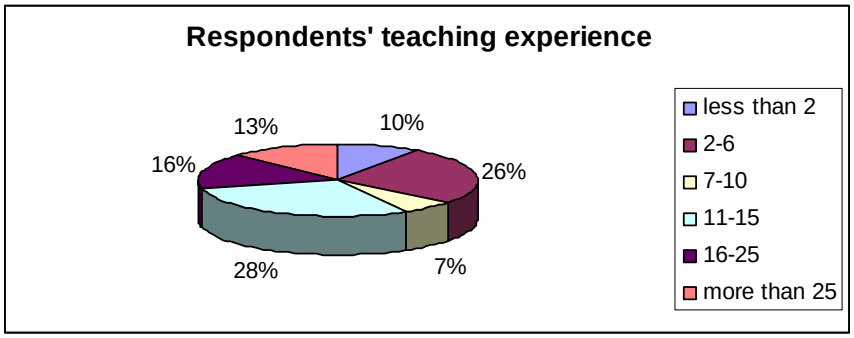

Figure 2. Respondents' teaching experience

3.2. Results

We grouped the affirmations in four clusters: those related with primary teachers' actions after reading the problem (Table 1), those related with teachers' behavior during problem solving (Table 2), those related with respondents' actions after solving the problem (Table 3), and those describing behavior when they can't solve the problem (Table 4). These tables contain percentages.

Table 1. Primary teachers' actions after reading the problem (1- not at all typical for me, 2- not typical for me, 3- typical for me, 4-very typical for me, 5 – totally describes me)

Affirmation	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
She/he knows if she/he can solve the problem.	3.2	29.0	35.5	25.8	6.5
She/he reformulates the text of the problem.	6.5	22.6	32.3	29.0	9.7
She/he annotates the given and the unknown data, and the relations between these.	0.0	12.9	19.4	25.8	41.9

Table 2. Primary teachers' behavior during problem solving (1- not at all typical for me, 2- not typical for me, 3- typical for me, 4-very typical for me, 5 – totally describes me)

Affirmation	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
She/he makes drawings.	0.0	6.5	38.7	25.8	25.0
She/he formulates questions.	0.0	6.5	51.6	19.4	22.6
She/he checks if she/he used all the data	0.0	0.0	22.6	38.7	38.7

Table 3. Primary teachers' actions after solving the problem (1- not at all typical for me, 2- not typical for me, 3- typical for me, 4-very typical for me, 5 – totally describes me)

Affirmation	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
He/she checks if the solution is correct.	0.0	9.7	25.8	22.6	41.9
He/she thinks if there are other ways of solving the problem.	9.7	48.4	29.0	9.7	3.2
He/she creates a similar problem.	12.9	58.1	19.4	6.5	3.2
He/she thinks what difficulties students could have with that problem.	0.0	6.5	35.5	32.3	25.8

Table 4. Primary teachers' behavior in case they can't solve a problem (1- not at all typical for me, 2- not typical for me, 3- typical for me, 4-very typical for me, 5 – totally describes me)

Affirmation	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
He/she searches for similar worked examples.	0.0	35.5	22.6	16.1	25.8
He/she reads the text again.	0.0	0.0	32.3	16.1	51.6
He/she simplifies the problem.	6.5	25.8	32.3	19.4	16.1
He/she asks the help of a colleague.	6.5	22.6	35.5	9.7	25.8
He/she knows what the difficulty is.	3.2	38.7	41.9	12.9	3.2
He/she gives up quickly.	51.6	45.2	3.2	0.0	0.0

4. Discussion

In this section, we analyze the results from Table 1, 2, 3 and 4. We have taken in consideration options 4 (very typical form me) and 5 (totally describes me), when we count the percentage of those who often do the action described in the affirmation. We have added the percentages from option 4 and 5 to get the percentages of those respondents for who the affirmation is typical. We have chosen this method of calculating neglegting option 3 (typical for me), as this option is the middle of the scale and in many cases when people are not sure what to respond select the middle option. Another reason is that teachers usually know which answers are expected, so they chose that something is typical for them only because they are convinced that they should make that action.

When faced with a problem, self-regulated learners begin to analyze the task in order to identify the requirements of it (Pintrich, 2000; Schunk, 2000). For the analysis step understanding the problem is essential. One way of being sure that we have understood the problem is to reformulate it with our own words. Only one third of the respondents (38.7%) do this frequently (Table 1). This is surprising as reformulating the problem is an important step of the problem solving, especially in primary school. Two third of the teachers (67.7%) annotates the given and asked data and the relations between these (Table 1). This high percentage could be explained by the fact that in primary classes annotating the data is emphasized. Drawing is another aid for understanding deeper a problem. This helps to visualize the problem. One third of the respondents (32.3%) frequently use this method (Table 2). This percentage is not high if we take in consideration that the respondents are primary school teachers, and in primary school, visualization is very important.

One third of the respondents (32.3%) know if they can solve the problem after reading the text (Table 1), but a much lower percentage (16.1%) know what their difficulty with the problem is if they can't solve it (Table 4). These results can be explained by two arguments. First of all, if someone doesn't have enough mathematical knowledge and problem solving skills, he/she can't evaluate the difficulty of the problem. Secondly, if someones self-efficacy is low, he/she is not trust in his/her ability to solve the problem.

Self-monitoring is important during problem solving. Formulated questions and checking if all the data and relations are used help to monitor the problem solving process. Less than half of the respondents (44%) question themselves during solving the problem (Table 2). A much higher percentage of the teachers (77.4%) check if they used all the data (Table 2). Checking if the outcomes are correct is essential. Almost two third of the respondents (64.5%) check if the solution is correct (Table 3). Even if it is a high percentage, this should be higher as checking the solution is an essential step of the problem solving.

Evaluation of the used strategy is important. After solving a problem, we should reflect on the methods and strategies we used, on the effectiveness of these strategies, and we should think about other methods of solving the same problem. Searching for other methods, evaluating and comparing these methods are useful. Only 12.9% of the respondents think about more ways for solving a problem (Table 3). This is a very low percentage for a teacher who should be open for the solving suggestions of the pupils; and for this purpose, he/she could handle more methods of solving the same problem.

Help seeking is also an important skill of a self-regulated learner. When someone can't solve the problem he/she need some help. Sometimes we only need to understand better the problem, so rereading it might help. Almost three quarters of the respondents (67.7%) do this (Table 4). Another way is to find a similar worked example in order to gather ideas, methods and strategies to be tried. Almost half of the respondents (41.9%) are looking for similar problems (Table 4). Simplifying the problem also might help in understanding what our difficulty is. Only one third of the teachers (35.5%) do this (Table 4). Maybe those who do not practice this strategy think that there is useless to solve a simplified problem. The same percentage of the respondents (35.5%) asks for the help of a colleague (Table 4). In Table 5 we have calculated the means and standard deviation for help-seeking actions based on numbers from 1 to 5 in concordance the option they have chosen. We observe that the mean for searching similar worked examples and for asking the help of a colleague is almost the same, but these two actions are not in correlation (Pearson correlation coefficient is 0.160).

Table 5. Means and standard deviations for affirmations describing help-seeking activities

Affirmation	Mean	Standard deviation
He/she searches for similar worked examples.	3.32	1.222
He/she reads the text again.	4.19	0.910
He/she simplifies the problem.	3.13	1.176
He/she asks the help of a colleague.	3.26	1.264

It is good that none of the respondents give up the problem solving easily (Table 4).

5. Conclusions

The main results of this research are:

- When analyzing the problem, only one third of the respondents rephrases the text of it and makes drawings for a deeper understanding. These two actions are very important for text comprehension.
- The respondents has good self-monitoring skills, almost two third of them check if the solution is correct and three quarters of the teachers check if they have used all the data of the problem.
- The respondents help-seeking abilities are low, less then half of them are searching for similar worked examples and one third of them ask for the help of a colleague in case of an insuccesful problem solving.

The results show that it is necessary to develop primary school teachers' problem solving and self-regulated learning skills.

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Aknowledgement

This work was supported by CNCSIS - UEFISCSU, project number PNII - IDEI 2418/2008.