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Znanstveni empirično-raziskovalni prispevek

Metacognitive, affective-motivational processes in self-regulated learning and students' achievement in native language[#]

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Abstract: Recent theoretical and empirical research has focused on metacognitive and affective processes in learning and performance in diverse domains of inquiry. The purpose of the study was to examine the relationship between these processes and achievement in native language (Slovene). 369 pupils in fifth grade of primary school participated in the study. A 41-item questionnaire was constructed to measure pupils' metacognitive and affective processes in learning native language. Factor analysis of the items revealed four different factors that accounted for 38.4% of the explained variance: two metacognitive (strategies of learning and solving tasks in Slovenian, searching for meaning and understanding in Slovenian) and two affective (experiencing fear of Slovenian, feelings of success and interest in Slovenian). Further analysis showed negative correlations between achievement and these factors: searching for meaning and understanding in Slovenian, experiencing fear of Slovenian. Positive correlation was found between achievement and the factor feelings of success and interest in Slovenian. In conclusion, implications for educational practice are discussed.

Key words: metacognition, motivation, anxiety, self-regulated learning, achievement, native language

Metakognitivni ter motivacijsko čustveni procesi pri samoregulativnem učenju in učenčevi dosežki pri učenju materinega jezika

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Povzetek: V zadnjem času je opaziti velik porast zanimanja za metakogntivne in motivacijsko čustvene procese na različnih področjih učenja. Namen naše raziskave je bil proučiti odnos med temi procesi ter dosežki pri materinem jeziku (slovenščini). V raziskavi je sodelovalo 369 učencev petih razredov osnovne šole. Za raziskovalne namene je bil sestavljen vprašalnik metakognitivnih in afektivnih procesov pri

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učenju materinega jezika, ki je vključeval 41 vprašanj. Faktorska analiza vprašalnika je pokazala štiri različne faktorje, ki pojasnjujejo 38,4% variance: dva metakognitivna (strategije učenja in reševanja nalog pri slovenščini, iskanje pomena in razumevanja pri slovenščini) in dva motivacijsko čustvena (doživljanje strahu pri slovenščini, doživljanje uspeha in interes pri slovenščini). Nadaljnja statistična analiza je pokazala negativno povezavo med dosežki in dvema faktorjema: iskanjem pomena in razumevanja pri slovenščini ter doživljanjem strahu. Med dosežki ter doživljanjem uspeha in interesa pri slovenščini pa obstaja pozitivna povezava. Rezultati imajo praktični pomen za uvajanje samoregulativnih mehanizmov pri učenju.

Ključne besede: metakognicija, motivacija, anksioznost, samoregulativno učenje, dosežki, materin jezik

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In rapidly changing world the major goal of formal education is not only to equip students with sufficient amount of knowledge in different domains, but also to prepare students to educate themselves after they leave the school. Students have to acquire self regulatory skills which will enable them to constantly up-date their knowledge. Becoming a self-regulated learner should be a final aim achieved by as many students as possible. The question how to achieve this aim is connected with metacognitive and affective-motivational processes in students. In searching for answer a lot of recent theoretical and empirical research has focused on these processes in learning and performance in diverse domains of inquiry (Boekaerts, 1997; Carr, Alexander & Folds-Bennett, 1994; Hofer, Yu & Pintrich, 1998; Pintrich & De Groot, 1990; Pintrich, Roeser & DeGroot, 1994; Pokay & Blumenfeld, 1990). An important shift in self-regulated learning (SRL) research was made in the last decade from focusing on cognitive and metacognitive processes toward emphasising the importance of integrated approach to cognitive, metacognitive and affective processes in learning. It can be seen in Hofer, Yu & Pintrich (1998) four component model of SRL that integrate knowledge/beliefs and strategies used for regulation in two general domains, cognitive and motivational.

Metacognition refers to the ability to reflect upon, understand and control ones' learning (Allen, & Armour-Thomas, 1992; Flavell 1979, 1981; Schraw & Sperling-Dennison 1994). Metacognition has two major components: knowledge about cognition and regulation about cognition. Knowledge about cognition includes three subprocesses that facilitate the reflective aspect of metacognition: declarative knowledge (i.e., knowledge about self and about strategies), procedural knowledge (i.e., knowledge about how to use strategies), and conditional knowledge (i.e., knowledge about when and why to use strategies). Regulation of cognition includes a number of subprocesses that facilitate the control aspect of learning, including planning (e.g. setting goals), monitoring (e.g. tracking attention and comprehension, self-testing for understanding), debugging strategies (e.g. finding mistakes and their correction) and evaluation (e.g. asking oneself if there is a better way to solve the problem).

Findings of research on metacognition and abilities are not consistent. Some researches indicated that gifted students displayed significantly higher strategy use than regular students in different learning contexts (Zimmerman & Maritnez-Pons, 1990). Körkel and Schneider (1992) found that verbal and non-verbal intelligence could influence the declarative and procedural metaknowledge. Verbal IQ was also found to influence metacognitive knowledge and strategy use (Schneider, Schlagmüller & Vise, 1998). But Swanson (1990) indicate that metacognition appears to be independent of general academic aptitude.

Similar inconsistencies can be found in research on metacognition and achievement. Some researches indicate that metacognitively aware learners are more strategic and perform better than unaware learners (Garner & Alexander, 1989; Pintrich & DeGroot, 1990; Schraw & Sperling Dennison, 1994; Schneider et al., 1998). Metacognitive knowledge can play a compensatory role in cognitive performance by improving strategy use (Artzt & Armour-Thomas, 1992). But some other researches found no relationship between metacognition and academic achievement (Pressly & Gathala, 1990). Pokay and Blumenfeld (1990) even found a negative relation between metacognitive strategy use and achievement and no relation between general cognitive strategies and achievement at the beginning of semester.

Very important role in student self—regulated learning play also affective variables. It is not enough just to know the successful strategies, one has to be willing to use them too. In general expectancy-value model of motivation (Pintrich & DeGroot, 1990) there are three components important for self-regulated learning: expectancy, value, and affective component. The expectancy component has been defined in motivational literature in a variety of ways: perceived competence, self-efficacy, control beliefs. It involves students' answer to the question: "Can I do this task?" Self-efficacy beliefs are defined as students' judgements of their capability to accomplish a task in a specific situation. They have been linked to a positive performance and achievement outcomes (Bandura, 1986; Schunk, 1985). Students high self-efficacy perceptions influence their use of self-regulated strategies too (Pintrich, Roeser & DeGroot, 1994; Zimmerman & Matinez-Pons, 1990).

The value component can be defined in terms of two dimensions: goal orientation and task value. Goal orientation can lead students to qualitatively different performance and achievement In intrinsic goal orientation students focuses on mastery and learning and in extrinsic goal orientation students approach the task with the concern about grades pleasing others or beating others. According to research finding intrinsic goal orientation has positive relation to cognitive outcomes and performance (Ames, 1992; Hofer, Yu & Pintrich, 1998). Task value refers to interest, utility and importance. Higher levels of task value should result in more motivated behaviour. Interest refers to students' personal interest and liking of the course material. Utility is students' perception of how useful the course material is to them. Importance concerns students beliefs how significant the course content is for them and their future goals. Expectancies for success and perceived value of the subject are

also positively connected with strategy use and grades (Pintrich & de Groot, 1990; Pintrich, Roeser & De Groot, 1994; Pokay & Blumenfeld, 1990).

The third motivational component that also influence students performance is affective component. It involves students reactions to the task (e.g. fear, pride, guilt, anger). In the school context, the most important seem to be test anxiety. The relationship between test anxiety and performance is usually negative, more test anxious students show lower performance (Pintrich & De Groot, 1990). Test anxiety is also negatively connected with strategy use and self regulation (Pintrich, Roeser & De Groot, 1994). This results are usually interpreted in interference model (Sarason, 1988). Test anxiety is seen as an interfering agent. Students know the course material but they "freeze" during the examination and they can not show their knowledge. According to deficit model (Birenbaum & Nasser, 1994; Musch & Bröder, 1999) students reduced performance can be due to the less thorough initial acquisition of the content. Test anxiety is only an emotional reaction that accompanies the awareness to be inadequately prepared for the test.

The purpose of the present study was twofold. First, we want to construct domain specific instrument that will measure metacognitive and affective-motivational processes in learning native language (Slovene). Our second purpose was to examine the relationship between these processes, abilities and achievement in Slovene language.

Method

Participants

367 fifth grade pupils from nine different schools in Slovenia (170 girls and 197 boys) participated in the study. The mean age of the children was 11,34 years. The fifth class of primary school was chosen, because we wanted to construct an instrument that can be used in second half of primary school (from the fifth to eight class) when problem in achievement usually occur.

Procedure

A questionnaire was constructed to measure pupils metacognitive and affective-motivational processes in learning native language (Slovene). All instruments (Questionnaire about Learning Slovene Language, Slovene Language Achievement Test, Figure Reasoning Test) were group administrated during regular classes at the beginning

of school year. Pupils final grades in Slovenian and their final success in fourth grade were also collected. Statistical analysis (factor analysis, reliability, correlation) were performed with SPSS-X program at the University of Ljubljana.

Instruments

A Questionnaire about Learning Slovene Language - QLSL (Peklaj, 1996) was developed to measure metacognitive and affective processes in learning Slovenian. Initial version of questionnaire was discussed with experts in the field of human cognition and learning and teachers of Slovene language. It was also applied in the fourth grade to check pupils understanding of the statements. Some of them were rewritten in more concrete way (e.g. when I read the task, I understand (know) what to do (make sentence analysis; when I make a mistake in writing (e.g. if I leave out punctuation marks), I quickly find it.). The final version has 41 statements relating to: strategy use in learning Slovenian, attention in learning Slovenian, correction of mistakes in learning and writing in Slovenian, anxiety in learning and examinations, and interest in Slovenian.

For each statement pupils were required to indicate on five point scale how often this statement is valid for them during they are learning Slovenian (1=never, 2=rarely, 3=sometimes, 4=often, 5=always). All the statements in QLSL, except the second, are scored in positive direction: the higher is the score, the more frequently respondent uses certain metacomponents in learning or show the interest or fear in Slovenian. A pilot administration of the questionnaire in other classes indicated that it could be completed in 25 minutes period.

Pupils abilities were assessed with Figure Reasoning Test (Daniels, 1971) which is adapted and standardised for Slovene population. Test includes 45 figural tasks. Each task consists of 3x3 matricula representing a certain rule or pattern. The last element in matricula is missing. Subjects have to choose it from among the six given answers. The test measure general (*g*) intelligence. Saturation with *g* factor is over 0.80. Reliability measured with split-half method is 0.96, with test-retest method (after two weeks) 0.97 and (one year) 0.89.

Slovene Language Achievement Test was also constructed for the purposes of the study. The test consists of 44 tasks covering grammar pupils have to master after first four years of primary school: use of prepositions (e.g. s, z, iz, h, k), punctuation marks (e.g. use of , . ! ?), sentence analysis (e.g. identifying predicate, subject, object). Each correct solution is scored with 1 point. Cronbach α coefficient of reliability for the test was 0.85.

Results

The first purpose of the study was to construct an instrument that will measure metacognitive and affective-motivational processes in learning Slovene language. Factor analysis (oblimin rotation, scree test) revealed four different factors that accounted for 38.4% of explained variance: two metacognitive factors (1. and 3. factor) and two affective-motivational factors (2. and 4. factor). All items had loading greater than 0.30. The Cronbach α reliability coefficients were 0.81, 0.83, 0.78, 0.79.

Factorial structure of Questionnaire about Learning Slovene Language:

1. FACTOR: strategies for learning and solving tasks in Slovenian (questions: 4, 7, 8, 9, 10, 11, 12, 13, 19, 20, 22, 23, 24, 26; 18.8% of explained variance; eigen value 7.71);
2. FACTOR: experiencing fear in Slovenian (questions: 31, 35, 39, 40, 41; 10.0% explained variance; eigen value 4.08);
3. FACTOR: searching for meaning and understanding in Slovenian (questions: 6, 15, 16, 17, 21, 25, 27, 28, 29, 36, 37; 5.2% of explained variance; eigen value 2.14);
4. FACTOR: feelings of success and interest in Slovenian (questions: 1, 2, 3, 5, 14, 18, 30, 32, 33, 34, 38; 4.4% of explained variance, eigen value 1.82).

The results show low to moderate positive correlations between strategies of learning and solving tasks in Slovenian and two other factors in questionnaire: searching for meaning in Slovenian and feelings of success and interest in Slovenian. A moderate positive correlation also exists between second metacognitive factor - searching for meaning and understanding in Slovenian and feelings of success and interest in Slovenian. The correlation between both affective-motivational factors (experiencing fear in Slovenian and felling of success and interest in Slovenian) is low and negative. Low and negative is also the correlation between experiencing fear in

Table 1: Correlations between factors in Questionnaire about Learning Slovene Language.

Factors	2	3	4
1	.01	.50***	.54***
2		-.23***	-.15**
3			.42***

Legend: Factor 1 - strategies of learning and solving tasks in Slovenian
Factor 2 - experiencing fear in Slovenian
Factor 3 - searching for meaning and understanding in Slovenian
Factor 4 - feelings of success and interest in Slovenian
** - p< .01, *** - p< .001

Table 2: Correlations among metacognitive, affective-motivational processes, abilities and achievement in Slovene language.

Factor	ABI	SLAT	FGSL	FS
M1	.03	.06	.08	.10
M2	-.22***	-.30***	-.20***	-.23***
AM1	-.15**	-.24***	-.20***	-.18***
AM2	.08	.11*	.18**	.16**

Legend: * - p < .05, ** - p < .01, *** - p < .001
M1 - strategies for learning and solving tasks in Slovenian
M2 - searching for meaning and understanding in Slovenian
AM1 - experiencing fear in Slovenian
AM2 - feelings of success and interest in Slovenian
ABI - abilities (general intelligence)
SLAT - Slovene Language Achievement Test
FGSL - final grade in Slovenian in 4. grade
FS - final success in 4. grade

Slovenian and searching for meaning in Slovene. These results suggest that metacognitive and motivational processes in learning Slovene language are interdependent.

Another purpose of the study was to examine the relationship between metacognitive and affective-motivational processes, abilities and achievement in Slovene language. The results are presented in table 2.

Two factors measured with QLSL are related to metacognitive processes in learning native language. The first metacognitive factor (strategies for learning and solving tasks in Slovenian) includes items about different strategies of learning and solving tasks in Slovenian (e.g. planning steps for solving the task, visual representation of the task, checking for understanding: concepts and contents, checking for mistakes and correcting mistakes). No statistically significant correlation's were found between this factor and abilities or any other achievement measures in Slovene language.

Second metacognitive factor searching for meaning and understanding in Slovenian includes items about different ways to understand the topics and to make learning meaningful (e.g. explanation of unknown concepts, trying to find connections of subject matter with already learnt material, with topics in other subjects, thinking about purposes of learning Slovene, usefulness of learning different topics, searching for understanding by asking and explaining contents to other students). Low negative correlation was found between this factor and abilities. Students with higher abilities use less strategies to make learning Slovene language meaningful. Low negative correlations were also found between this factor and results in achievement test, final grade in Slovenian and final success. Students with higher achieve-

ment report less searching for meaning in learning native language.

Other two factors measured by QLSL comprised affective-motivational processes in learning Slovene language. The factor of experiencing fear in Slovenian incorporates items about fear in learning and fear of examinations in Slovene language. Negative statistically significant correlation was found between experiencing fear and pupils abilities. A higher degree of fear was experienced by pupils with low abilities. Statistically significant correlation between experiencing fear and achievement test, final grade in Slovenian and final success were also low and negative. A higher degree of fear was experienced by pupils with low achievement.

The last of four factors was also connected with motivational processes. Items in the factor feeling of success and interest in Slovenian refers to the feeling that one is able to understand and retain content in Slovenian, a feeling of competence and internal motivation for native language and different activities related to it (reading, writing). Low positive correlation's were found between this factor and results in Slovene language achievement test, final grade in Slovenian and final success. Feeling of success and interest in Slovene language is more strongly expressed in high achievers than in low achievers.

Discussion

The results of our study of the relationships between metacognitive processes are contradictory at the first sight. Only one of the two metacognitive factors is connected with students abilities and achievement in Slovene language and the correlations are even negative. Strategy use in our study is not connected with students abilities and their achievement in learning Slovene language. These results are consistent with research that also did not find connections with intellectual ability (Swanson, 1990) or domain specific knowledge (Glenberg & Epstein, 1987). The reason for such results can lie in the task perceived difficulty. Problems believed to be too easy or too difficult are less likely to elicit strategic behaviour than problems that represent a moderate degree of challenge (Belmont & Michell, 1987; DeLaoche, Cassidy & Brown, 1985). It is reasonable to believe that only a child who sees the task in the sphere of his abilities will benefit from strategy implantation. Children who feel a task is far too difficult to solve successfully will fail to excerpt the effort necessary for strategic action and children who can easily and accurately perform a task will spend little time choosing and executing "unnecessary strategies (Rellinger, Borkowski, Turner & Hale, 1995).

Negative correlations were found between searching for meaning and understanding in Slovenian and abilities and achievement. Students with higher abilities direct less attention to connections between previously learnt content and new one, to the meaning of certain expressions, to personal meaning of learning of native language. They probably learn in automatic and non reflective way. Thinking about

meaning of learning in native language and connections between different parts of learning material is probably not instrumental in their learning. Winne (1997) suggest that a lot of SRL is not deliberate and can be carried out tacitly, "unconsciously". And the goals of students are not always the same as goals of their teachers. If the students' goal is to achieve good grade and if it is possible without effort and deliberate use of SRL, he will probably not use it. But for low achievers even very simple task can be much more demanding and they have to think about the connections and the purpose of their learning more often, if they want to be successful at learning.

Some items in this metacognitive factor are also related to environmental dimensions of self-regulated learning, namely to seeking peer assistance in learning. Our results are not consistent with Zimmerman and Martinez-Pons (1999) results on relationship between giftedness and seeking peer assistance in learning. They found that gifted students seek more peer assistance than nongifted students. Learning with classmates, cooperate with them, seeking for their help probably have negative value for high achieving students in Slovenia. Our school system is very competitive and orientated toward individualistic learning. Seeking help is probably perceived as having too low abilities to learn or solve the task alone.

The results about affective-motivational processes in our study are consistent with other researches (Boekaerts, 1997; Carr et al., 1994; Pokay & Blumenfeld, 1990). Positive correlation between fillings of success and interest in Slovenian and students performance was found. Boekaerts (1997) found in her research on motivation and performance in different subjects that pupils who judge that they like doing the tasks, pupils who find the task important and pupils who judge themselves as competent were also prepared to invest more effort in learning. It is reasonable to think that pupils who experienced success and have interest in learning Slovene language were also prepared to invest more effort in learning Slovenian which led to higher achievement results.

Negative correlations among experiencing fear, abilities and achievement are also consistent with other research (Neveh-Benjamin, McKeachie & Lin, 1987; Pintrich & De Groot, 1990). Student with high abilities and achievement experience less fear when they are learning Slovenian and when they have to show their knowledge at the examinations than low achieving classmates. The negative correlation between experiencing fear in Slovenian and other two metacognitive factors in study suggests that poor performance of highly test anxious students and better performance of low anxious students is due to problems not only in the test situation, but also in other stages of learning.

Some implications for the educational practice can be derived from the research. Affective and motivational processes are inherent part of self-regulated learning. If the teacher want to "equip" students with successful learning strategies they will be able to use after their regular schooling, they have to show them the usefulness of metacognitive knowledge through its application with interesting learning tasks

that will be at the appropriate level of difficulty for low, medium and high achieving students. They will also have to take into account some dimensions of learning environment. Experiencing success in learning native language will reduce anxiety and promote internal motivation for Slovenian. Pupils who experience that they are able to learn Slovenian will invest more effort in its learning in the future. Teacher should create such learning experiences in which all pupils regardless of their abilities can experiment and enjoy without anxiety. Another important task in Slovene school will be to change the climate from the competitive to more co-operative, to teach students to see co-operation with others as a mean to reach mastery at different learning domains instead of perceiving it as a lack of competence. Both of these tasks could be achieved through balanced use of cooperative, individualistic and competitive learning situations in the classroom (Peklaj & Vodopivec, 1999).

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Appendix: Items in QLSL

Factor 1- Strategies of learning and solving tasks in Slovenian:

4. When we are solving tasks in Slovenian (e.g. grammar exercises), I first read the task carefully.
7. When I don't know the meaning of certain word (expression), I try to find it in a dictionary or I ask somebody what does it mean.
8. I start solving the task by trying to remember the way we usually solve similar tasks (e.g. how we define verb, adjective), afterwards I work according the same procedure.
9. When I solve the task, I try to find out the segments of the matter that it belongs to (e.g. word analysis, sentence analysis).
10. When solving the task, I try to imagine what will final product look like (e.g. what will be written in an essay) first, and then I start working.
11. When solving a task, I first of all reflect all the steps in the procedure of task solving (I make a plan), and then I start solving it.
12. When I finish the task (e.g. write an essay), I read it again and check what I had wrote.
13. When I finish the task (e.g. define verbs tense), I check again if I made a mistake.
19. When I make a mistake in writing (e.g. if I leave out punctuation marks), I quickly find it.
20. I correct a mistake at writing.
22. When learning Slovenian, I try to remember fact and definitions as exactly as I can.
23. When learning Slovenian, I try to understand what I am learning.
24. I try to remember topics in Slovenian exactly as it is written in the book or the teacher has explained
26. When studying Slovenian, I try to review the material in my own words.

Factor 2 - Experiencing fear in Slovenian:

31. I feel anxiety, while I am learning Slovenian.
35. I am afraid of questioning in front of board in Slovenian.
39. I feel anxiety of writing test in Slovenian.
40. I feel anxiety when we write an essay in the school.
41. I am afraid of questioning at my desk in Slovenian.

Factor 3 - Searching for meaning in Slovenian:

6. After I have read the task, I ask myself if I understand all the words (expressions) in it.
15. If I have explained a certain topic to a classmate, I remember it better.
16. I understand better the topic that I have explained to someone before.
17. I understand a content explained by a classmate better than the same content explained by the teacher.
21. If someone, while I am learning, tells me how the task has to be solved (e.g. where to put the punctuation marks at direct speech), I will try to solve it the same way myself.
25. When learning, I try to connect the things I am reading about with what I already know.
27. When learning Slovenian, I think of were I shall need this knowledge.
28. When learning some topic in Slovenian, I try to connect it with topics in other subjects.
29. When I am learning, I write out the most important information.
36. I think about the meaning of learning Slovenian.
37. I like to read poetry.

Factor 4 - Feelings of success and interest in Slovenian:

1. I understand learning matter in Slovenian.
2. I find the learning matter in Slovenian difficult.
3. I remember topics in Slovenian.
5. When I read the task, I understand (know) what to do (e.g. make sentence analysis).
14. I discover the mistake I make in at solving tasks.
18. When studying Slovenian, I am attentive (concentrated), my thoughts are not elsewhere.
30. I like Slovenian.
32. I find topics in Slovenian interesting.
33. I would learn Slovenian although it would not be compulsory at school.
34. I also like reading different tales, stories, novels, that are not compulsory for homereading or competitions.
38. I have already wrote a poem or a story myself.

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