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COMPONENTS OF SELF-REGULATED LEARNING; IMPLICATIONS FOR SCHOOL PERFORMANCE

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Abstract: Self-regulated school learning behavior includes the activation of a relatively large number of psychological dimensions. Among the most important self-regulation constructs that influence school learning are: learning goals, personal self-efficacy, metacognition and test-anxiety. The adaptive functioning of these is associated with high performance at school and advanced learning competency. Previous studies have identified numerous correlations between the above mentioned variables. Thus, different learning goals determine different evolution trajectories. Competency and performance goals can activate cognitive, motivational, affective strategies and differences in performance. Advanced metacognition is linked with high self-efficacy and good learning achievements. Competency goals are good predictors of advanced processing. Competent pupils more frequently use in-depth processing and a high level of critical thinking, being more able to use self-regulated learning in comparison to less competent students. As school years advance, particular constructs show a specific evolution pattern, described in the present study.

Key words: self-regulated learning, metacognition, cognitiv regulation, motivational regulation, emotional regulation, school performance

1. Introduction

The present study aims to identify the evolution pattern of the constructs (psychological dimensions) that represent operationalizations of learning behavior, throughout medium and advanced scholarization (6th, 8th, 10th, and 12th grade). The multidimensional construct of "learning behavior" was measured with instruments that include four types of self-regulation (cognitive, metacognitive, motivational and emotional).

More specifically, the study set off to identify the variables involved in the process of school learning, describing the relations between these, as well as the way each construct develops as school age advances. Research was conducted with students of medium school age (6th and 8th grades) and older age (high school, 10th and 12th grades). The investigation process started off by performing a critical analysis of the complex models of self-regulated learning existing in the literature, elaborated by known authors (Boekaert, Borkowski, Pintrich, Winne, Zimmerman). The next step consisted in identifying the potential mediating variables between the *distal traits* (intelligence level, cognitive abilities, and learning goals) and *proximal states* (school performance). Thus, the research encompassed identifying the variables that influence the complex process of self-regulated learning, describing the relations of covariance between these constructs, and exploring their evolution within the transition from gymnasium to high school.

Variables that are activated within the school learning process were grouped in three major categories: (a) learning goals; (b) cognitive, metacognitive, motivational and emotional strategies; (c) school performance **(Table 1).**

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Tabel 1. Activated variables in school learning

Distal traits	Regulation	Proximal states	
Cognitive abilities **Goal orientation:** - mastery goals - performance goals - work avoidance goals	**Metacognition** - metacognitive knowledge - metacognitive regulation **Motivation** - intrinsec value - effort - perseveration **Emotion** - test anxiety - positive emotion - negative emotion	**Knowledge** - declarative knowledge - procedural knowledge	**School performance** - school evaluation

2. Description of the constructs used within the study

2.1. The relation between learning goals-self-regulatory strategies-school performance

Learning goals are the first variables analyzed in the present study. Most research focusing on achievement goals point to the existence of two goal categories with relevance for the school learning process: (a) performance goals, when a person wants to attain superior results in comparison with the others; (b) competency goals, when individuals want to develop their own competency through solving school tasks (Ames & Archer, 1987). In one study published in 1997, Elliot and colab. proposed a distinction between three types of learning goals, that represent at the same time a revised alternative of the dichotomy of performance goals-competency goals. In this new approach, the construct of performance goals is classified in two subconstructs, thus resulting in three different types of goals: focusing on competency versus focusing on performance versus focusing on avoiding failure. Students who form the third type of goals want to avoid the perception of failure and incompetence. Each one of the three types of aims can lead to different acquisitions and school results.

Previous studies have shown that the three types of orientations have a different impact on the way students approach, interpret and answer to school tasks. For example, a meta-analysis by Rawsthorne and Elliot (1999) concluded that focusing on competencies develops a higher sense of intrinsic motivation compared to focusing on performance. Moreover, a study by Colquitt and Simmering (1998) shows that competency goals protect the individual from "motivational failure" in approaching challenging tasks. A high level of competency goals leads to a high level of self-efficacy, that by itself has a positive impact on effort, persistence and performance (Phillips & Gully, 1997). Based on these results, researchers came to the conclusion that students who adhere to competency goals are much more involved and persist more in solving tasks as compared to those who focus on achievement.

At the same time, numerous studies in the field of self-regulated-learning have analyzed the impact of learning goals (performance versus competency) on school outcomes (Pintrich, 2000; Pintrich & Schunk, 1996). Competency goals within school performance correlate with a series of positive results: high level of self-efficacy, valuing tasks, high interest, positive emotional reactions, sustained effort and task persistence, use of effective cognitive and metacognitive strategies, superior achievements, etc. On the contrary, performance goals determine students to compare their own achievement with that of others and avoid situations where they show incompetence or lack of skill in comparison to others. Performance goals show little adaptive value when analyzed form the perspective of motivation, affective reactions, applied strategies and level of achievement (Ames, 1992; Dweck & Leggett, 1988; Pintrich, 2000; Pintrich & Schunk, 1996).

A study conducted by Wolters, Yu and Pintrich (1996) illustrates that high performance goals predict high levels of the following constructs: self-efficacy, valuing tasks, cognitive and metacognitive strategies. The positive effect of performance goals appears independently from the positive effect of

competency goals, idea sustained by research conducted by Harackiewicz and Elliot (Elliot & Church, 1997; Harackeiwitz et al., 1997). While trying to synthesize the numerous divergences, Pintrich (2000) states that goals which are oriented in a different way determine dissimilar development trajectories. His analysis suggests that competency and performance goals can activate different cognitive, motivational, affective strategies and differing achievements. People have different goals and can have diverse development trajectories but similar final results, even if educational experiences during this time interval are diverse.

2.2. The relation between learning goals-metacognition-school performance.

Research in the filed of educational psychology has investigated academic success in relation with numerous other variables, particularly with two: learning goals and metacognition. The present study aims to examine *goals of academic learning* and *metacognition* in relation with *academic achievement*. Previous studies show that two types of goals can guide academic learning activities: competency goals and performance goals (Dweck & Leggett, 1988). Competency goals help students focus on leaning and its content, and correlate positively with high self-efficacy, effective metacognition and high performance. Students who form competency goals prefer challenging tasks and invest effort when facing difficult learning situations. In case of failure, they focus their attention resources on the task and respond with positive emotions. Performance goals encourage students to focus on school grades and avoid being perceived as incompetent. They invest effort in order to demonstrate their abilities and to avoid being negatively assessed. They avoid challenges and obstacles that occur in the school learning process and prefer easy tasks that ensure their success. When faced with challenging tasks they manifest diverse reactions: they draw back because of risk of failure, show negative affective reactions, attribute failure to lack of academic ability and demonstrate decreased interest for the task. Research in this area has proven that the two types of goals can coexist independently, a fact which allows students to form multiple goals simultaneously. Thus, focusing on competency can coexist with the desire to obtain positive evaluations (Pintrich & Garcia, 1991; Meece & Holt, 1993). Students can adhere to one single goal or both types of goals. In the latter case, a pattern emerges where one of the aims receives the status of principal goal while the other becomes secondary. In other words joint functioning determines goal hierarhization.

The second variable included in the study, metacognition, represents a factor and important predictor of academic success (Dunning, Johnson, Ehringer, & Kruger, 2003). Well developed metacognitive abilities correlate with good performance at school, while individuals with ineffective metacognition are often seen as incompetent. Metacognition allows people to learn strategically and predominantly process new information (Everson & Tobias, 1998).

While several studies have demonstrated the existence of a positive significant correlation between centering on competency and metacognition (Armes & Archer, 1988; Dweck & Leggett, 1988) the relationship between metacognition and performance goals is less clear. Some studies indicate a weak positive relation between metacognition and performance goals (Wolters, 1998), while others a nonsignificant correlation (Ford, Smith, Weissbein, Gully & Salas, 1998). Performance is more strongly associated with competency goals than with performance ones (Button, Mathieu & Zajac, 1996). On the other hand, some studies argue for the existence of nonsignificant correlations between school achievement and performance goals (Butler, 1993; Button, Mathieu & Zajac, 1996), while others suggest significant correlations (Elliot & Church, 1997; Middleton & Midgley, 1997).

2.3. The relation between learning goals and cognitive strategies

During the past two decades research in the field of learning psychology has outgrown the assumption of stable personality characteristics in relation with this issue, highlighting individual choice in approaching learning tasks. Studies within this new paradigm, initiated by Marton and Saljo (1976) identified two levels of information processing: *in-depth processing* and *surface processing*. In-depth processing (also known as critical thinking – Weinstein & Myer, 1986) involves verifying the processed information and linking new facts with previous knowledge of the person. Surface processing implies memorizing and mechanical recall of information.

Research that tried to link *learning goals* with *cognitive strategies* shows clear relatively congruent results. Many of these studies demonstrate that competency goals are positive predictors of in-depth

processing (Anderman, Griesinger & Westerfield, 1998; Anderman & Young, 1994; Nolen & Haladyna, 1990; Pintrich et al., 1993; Schraw, Horn, Thorndike-Christ & Bruning, 1995). Competency goals are positively correlated with task persistency (Bouffard, Boisvert, Vezeau & Larouche, 1995; Pintrich, 1989; Pintrich et al., 1993) and effort (MacIver, Stipek & Daniels, 1991; Meece & Holt, 1993; Miller et al., 1996; Wentzel, 1996). Studies that analyze *surface processing* show mixed results. Some of these argue for the existence of positive relations between the two variables (Miller et al., 1996; Nolen, 1988; Nolen & Haladyna, 1990; Pintrich, 1989; Schraw et al., 1995), wile others have found nonsignificant relations (Harackiewicz et al., 1998; Greene & Miller, 1996; Pintrich & Garcia, 1991; Pintrich et al., 1993). Students who show competency in learning more often apply in-depth processing and high levels of critical thinking, being better at self-regulated learning as compared to less competent pupils.

2.4. The relation between self-efficacy (general vs. specific) and school performance

Among the motivational variables involved in self-regulated learning, the construct of self-efficacy plays a major role (Pajares & Schunk, 2001). *General self-efficacy* represents the belief of the individual about his or her own capacity to self-regulate his/her learning (form goals, self-monitoring, use of strategies, self-evaluation, applying interventions to improve learning etc.). Self-efficacy differs from an operational point of view from other self-constructs, as items measuring it are formulated in terms of what a person *can do*, more than what a person *would like to do* or really *does* on a regular basis in a particular activity domain (Bandura, 1997).

Before approaching a task, pupils take in various personal and contextual aspects, like personal abilities, task difficulty, the required amount of effort to solve the task, the available help resources, previous failure and success (Schunk, 1989; Winne & Hadwin, 1998). Bandura (1993) argues that the perception of self-efficacy (the trust in one's own capacity to respond to challenges and achieve goals) influences the way a person responds to a task. Thus, self-efficacy predicts if the person chooses to get involved in the task. A person with the same knowledge and abilities can obtain low, medium or good results as a function of fluctuations in personal self-efficacy (Bandura, 1993). When pupils perceive personal abilities to be overpowered by task difficulty, low self-efficacy expectations determine stress, dysfunctional cognitive involvement and limit experimentation with new and risky strategies (Winnie, 1997). The person receives internal or external feed-back as it proceeds with solving a task and these evaluations strengthen or weaken self-efficacy. High self-efficacy helps people who deal with challenging tasks, while low self-efficacy determines excessive focusing on errors, therefore diminishing performance (Pajares, 1996).

Studies show that students with high self-efficacy benefit from high educational achievements. Consequently, they are more capable of self-regulation (Bandura, 1993; Schunk, 1996; Skaalvik & Rankin, 1995; Zimmerman et al., 1992), prefer challenging tasks (Bandura & Schunk, 1981), invest more effort in solving tasks (Schunk, 1983), persist more in solving difficult tasks (Schunk, 1982; Bandura & Schunk, 1981), set higher goals (Zimmerman, 1995), show low test-anxiety, apply more effective learning strategies (Pintrich & DeGroot, 1990) and use in-depth information processing (Bandura, 1993; Multon, Brown & Lent, 1991). The contribution of self-efficacy to school acquisitions can be explained by the effective use of cognitive strategies and through the positive impact that this construct has on metacognitive and coping abilities.

Self-efficacy acts at an extended level through the use of metacognitive strategies in a more effective way, which implies planning and self-regulation, abilities that become more important as the person advances in school age. Metacognition implies reflecting on the control of ones' own cognitive activity and using all resources that belong to the individual, the task and the social context in order to achieve goals (Zimmerman, 1995; Zimmerman & Martinez-Pons, 1988). Students with high academic self-efficacy apply cognitive learning strategies more effectively, organize time and learning environment more efficiently and monitor and regulate better their personal efforts. Academic self-efficacy is associated with the trust in controlling school tasks, an accurate predictor of obtained grades.

3. Research methodology

Participants. The cross-sectional study included 195 participants, pupils from the "Lucian Blaga" high school from Cluj Napoca, out of which 98 from gymnasium (44 pupils from sixth grade and 54 from eighth grade) and 95 from high school (49 from 10th grade and 46 from 12th grade). The mean age for 6th grade was 11 years and 2 month; for pupils from the 8th grade it was 14 years and 5 months; for the 10th grade it was 16 years and 3 month, and for 12th grade it was 18 years and 7 months. The gender distribution was 44% girls and 56% boys. Participants are from families with a different educational and socio-economic background. Families as well as school management have given their consent for including pupils/children in the present study.

Procedure. Data were collected during the first semester of the school year 2008-2009. Before completing the package of questionnaires, students were informed concerning the aim of the study-identifying the way in which pupils learn and the factors that influence this process. Students were told that taking part in the study is optional. They filled in the questionnaire-package during the counseling/class meeting hours (2 hours). Questionnaires were filled out under the supervision of the researcher, who read each item in front of the class, offered explanations, helped students complete questionnaires ensuring the quality of responses.

Measured constructs. The elaboration of the cross-sectional study meant that in a first stage, several variables and constructs were measured. These are constructs are from acknowledged models of school learning that argue that they influence the learning process. Thus, instruments were selected and applied in order to allow for the analysis of the school learning process. Chosen questionnaires had been validated and published in previous studies. The second phase of the experimental study implied the identification of the evolutionary pattern of the investigated constructs, throughout school age progress (sisth, eighth, tenth and twelfth grade). The MAI (Metacognitive Awareness Inventory, Schraw & Sperling-Dennison, 1994) made possible the measuring of another construct involved in school learning- **metacognitive regulation**, operationalized by two factors: metacognitive knowledge and metacognitive regulation.

The cognitive regulation capacity was assessed with the help of a cognitive strategy scale from the MSLQ questionnaire, and the RASI (Revised Approaches to Studying Inventory, Duff, 1996; Entwistle & Tait, 1995) allowed for identifying and quantifying types of cognitive processing: in-depth, surface and strategic.

The motivational dimension of learning was operationalized through the constructs of learning goals, intrinsic values, dysfunctional motivational strategies, self-efficacy and test anxiety. The construct of *learning goals* was explored with the help of the GOS questionnaire (Goal Oriented Scale; Midgley, Kaplan, Middleton, Maehr, Urdan, Anderman, & Roesr, 1998). The scale for *intrinsic values* was included in the MSLQ-Motivational Strategies for Learning Questionaire (Pintrich, Smith, Garcia, McKeachie, 1991). The same questionnaire contains the scale for *test anxiety*, with 4 items. The construct of anxiety was assessed with the scale with the same name from the LASSI questionnaire. The *dysfunctional motivational strategies* manifest by postponing school tasks or insufficient effort investment in solving them. These are quantified in the present study through a 5 item scale elaborated by Midgley, Arunkumar, and Urdan (1996). The SELF questionnaire (Self-Efficacy for Learning Form- Zimmerman & Kitsans, 2005) measures the *school learning self-efficacy*, while the homonym scale from the MSLQ questionnaire was used to assess *general self-efficacy.*

The emotional component of learning was measured with the help of the positive and negative emotions scale experienced in the school context (Pintrich, 2000). The negative affect scale includes four items that refer to how often students experience anger, shame, embarrassment and frustration. The positive affect scale quantifies the frequency of the states of happiness, pride, positive disposition and having fun.

Results. Research data were statistically analyzed with SPSS. Means, standard deviations, values of the F test; F values of the post-hoc Turkey (between class comparisons for each type of regulation that was analyzed) were computed.

Means, standard deviations and F test values

Table 2 contains the means and standard deviations of the scores obtained for each type of regulation (cognitive, metacognitive, motivational and emotional) for different class levels. The value of the F test shows a significant main effect for all grades of students and for all types of regulation analyzed. In the case of the studied variables, there are significant longitudinal differences between grades 6th - 8th- 10th-12th. The only exception from this pattern is the negative emotional reactions scale from the emotional regulation, for which the F value is nonsignificant. Thus, negative emotions do not significantly change with the advance in school years.

Tabel 2. Means, standard deviations and F test value for cognitive, metacognitive, motivational and emotional regulation.

Type of regulation	**4th grade**		**8th grade**		**10th grade**		**12th grade**		**F**	**p**
	m	**σ**	**m**	**σ**	**m**	**σ**	**m**	**σ**		
Congitive regulation										
- cognitive strategy	31.05	4.97	27.27	4.72	38.62	7.84	39.48	6.73	42.70	.00
- deep proceses	39.56	9.47	33.56	5.66	33.62	6.97	34.04	7.17	7.31	.00
- surface proceses	34.57	6.76	32.61	6.07	31.06	7.58	30.65	6.67	3.25	.02
- strategic proceses	39.69	5.77	34.61	6.50	32.22	8.85	32.21	7.83	11.42	.00
Metacognitive regulation										
-metacognitive knowledge	62.70	10.27	61.50	9.78	62.18	9.91	67.70	7.87	4.40	.05
-metacognitive regulation	85.85	13.70	82.89	13.69	80.42	11.55	91.06	10.30	5.72	.01
Motivational regulation										
- task goals	21.64	4.86	19.07	4.25	18.08	4.62	17.89	5.31	6.43	.00
- mastery goals	22.00	4.24	19.58	4.77	18.33	4.96	18.70	5.40	5.58	.00
- work avoidance goals	21.98	4.91	19.05	4.77	18.08	4.33	16.51	4.68	11.98	.00
- intrinsec value	36.36	6.51	30.31	6.51	30.50	6.15	29.19	6.53	13.22	.00
- self-efficacy	34.60	5.68	30.77	6.90	30.37	5.59	31.51	7.89	4.48	.00
- disfunctional motivational strategy	14.07	4.93	12.05	4.00	12.72	3.64	11.76	4.76	2.66	.05
Emotional regulation										
- positive emotion	15.55	4.11	12.23	3.58	12.10	3.86	10.93	3.78	12.76	.00
- negative emotion	8.62	3.86	10.21	3.61	8.83	3.60	8.61	3.58	1.76	ns
- test anxiety	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

The F test (post-hoc Turkey)

Because the F test has significant values for all the scales that measure the regulation types that were analyzed, the next step in data analysis was to calculate the F post-hoc Turkey test values. This test helps us identify the specific participant groups (classes of students that were compared successively, two by two) where significant differences were found (**Table 2**).

Therefore, for *cognitive regulation*, significant differences emerged in all classes of pupils in what concerns the use of cognitive strategies. In-depth processing and strategic ones show significant differences between the 6th grade and superior grades (eight, tenth, twelfth), meaning that students apply more often in-depth and strategic processing once they advance in school age.

Metacognitive regulation shows incongruent results with the initial predictions, also different from the conclusions of earlier studies. Thus, for the metacognitive knowledge scale (the metacognitive regulation dimension), the F post-hoc values show negative significant differences between grades 6th-12th, 8th-12th, 10th-12th. Metacognitive knowledge of pupils from 6th grade, 8th and 10th are better developed in comparison with the ones of those in 12th grade. Therefore, the present study

indicates that pupils from 12th grade have the lowest level of metacognitive functioning, in comparison with younger students.

In what concerns the metacognitive regulation scale, there are significant differences between grades 8th- 12th and 10th and 12th , in favor of 8th and 10th grades. In other words, metacognitive regulation is significantly more effective at the level of grades 8th and 10th, then for 12th grades. Earlier studies argue that in general, metacognitive competencies develop progressively, together with the advance in school age, a conclusion that contradicts the results of the present study.

None of the *motivational regulation* scales present significant differences between the grades 8th-10th- 12th, indicating that for this school age group, the pattern of learning goals that students use is relatively heterogeneous. In contrast, comparisons between 6th graders and older ones (from eighth, tenth, twelfth grades) are significant for learning goals, intrinsic values and general self-efficacy. The scale for dysfunctional motivational strategies shows significant differences just between grades 6th-12th, with a disadvantage of 6 th graders (dysfunctional motivational techniques are more frequent at the level of sixth grade).

For the level of emotional regulation, the F indicator shows significant differences for the test-anxiety scale, between 6th-10th grade and 6th-12th. There are significant differences also for the positive affect scale, between grades six-eight, six-ten and six-twelve. There are no significant differences between grades eight-ten-twelve in what concerns affect regulation (positive and negative emotional reactions).

4. Conclusions and implications

Among the experimental approaches proposed by the present study, one important investigation direction was the identification of the behavioral evolution in self-regulated learning of students during medium and superior schooling (sixth, eighth, tenth, twelfth grades). Due to the quasi-manifestation of self-regulated competencies at a younger school age, the study focused on medium and superior school age. The multidimensional construct of "self-regulated learning behavior" was operationalized through 4 types of regulation (cognitive, metacognitive, motivational and emotional). Specifically the study aimed to identify the variables that are activated during the school learning process, the relations between them and the way in which each of this constructs develops with the progress in school age. The study started off from the analysis of results of experimental studies on self-regulated behavior existing in the literature, elaborated by authors cited above.

The metacognitive regulation dimension presented incongruent results with the conclusions of earlier studies, which can be explained by intercultural differences or educational system differences. Thus, metacognitive knowledge of the pupils from grade six, eight and ten is better developed than those of 12th graders. Moreover, for the metacognitive regulation dimension, there are significant differences between grade eight-twelve and ten-twelve, in favor of 8th and 10th graders. Metacognitive regulation is significantly more efficient in the case of 8th and 10th graders than for students from the 12th grade. The majority of studies published in this domain argue that in general, metacognitive competencies develop progressively together with advancement in school age, a conclusion that contradicts the results of the present study.

Data obtained as a result of the investigation of cognitive regulation are again very surprising. Thus, for the gymnasium level (sixth and eighth grades) the cognitive regulation does not show a significant positive development (the cognitive processing of 8th graders are not better than those of 6th graders). On the other hand, the same type of cognitive regulation manifests a rising evolution at high school level. Results demonstrate major deficits in the present Romanian formal education system:

- an overemphasis placed on memorizing strategies, leaving understanding and self-regulated learning at a disadvantage
- an overload of information included in the school curricula, at the disadvantage of training specific cognitive processes that are transferable to other contents and knowledge.

In what concerns *emotional regulation*, there are significant differences in test-anxiety only between grades six-ten and six-twelve. During high school, the mechanisms of emotional regulation (test-anxiety, positive and negative emotional reactions) do not show major changes.

As expected, these observations raise several potential questions: what relations exist between cognitive regulation and metacognitive regulation? Is it possible that in the same age group one type of regulation develops while the other stagnates? What psychological factors explain the incongruous development of the two types of regulation? To what extent educational interventions target the development of one type of regulation that would impact on the other? Such questions can be the starting point for further research, with great applicability in the field of education.

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