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- DOCTORAL THESIS -

**OPTIMIZAREA PROCESULUI DE PREDARE-ÎNVĂȚARE PRIN
TEHNICI DE FACILITARE METACOGNITIVĂ LA ELEVII DIN
CICLUL GIMNAZIAL**

- SUMMARY -

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INTRODUCTION

The contemporary society's pace has its drawbacks on the human living conditions, in the sense that it implies a continuous readjustment to the informational demands, as well as the elaboration of adaptive behaviors in regard with the new challenges and contexts. It appears the necessity for knowledge and constant training because the modern man needs to adjust to changes, to the perpetual innovations in the professional domain, of science, changes which reorganizes the whole content of life and the values which we promote.

The effective knowledge conditioned by an efficient metacognition, also by a reflection and a cognition over a cognition, a knowledge about knowledge. In the specialized literature, metacognition benefits of a series of conceptual delimitations which are more or less defined, to which we will refer to in the following pages.

The teaching-learning-evaluation process implies methods, techniques and modern strategies of teaching. In practice, to teach how to learn becomes a major desideratum for the current educational system, the process of teaching learning evaluating implies techniques, retention strategies, organization and assimilation of the relevant information but most of all planning and evaluation capacities and tracking.

Thus, the researchers' interest is pointed towards the formation of independent learning abilities. It can be affirmed that the effectiveness of learning, to teach how to learn becomes a finality and it is one of the major problem of the current educational system. It can be said that the effectiveness of learning depends on one hand on the baggage of accumulated knowledge by students, but the motivational and emotional aspects and the personality of the students are also important. Learning in school but also learning in extracurricular contexts determine the development of skills and attitudes towards learning. Furthermore, it can be said that the school abilities essentially contribute to enhancing the learning capacities, the strong appropriation of knowledge, basic skills and understandings as well as increasing the possibilities of applying these skills in the social and professional life.

I. TEACHING-LEARNING-ANALYZING FROM THE DIDACTICAL AND COGNITIVIST PERSPECTIVE PROCESS

From the multiple definitions and correlative approaches over teaching and learning, we will stop at the following: "Teaching and learning are inseparable activities; learning is the principal reason of teaching and, mostly, its result." (Chiş V.,2005).

Seymour and Hewitt(1994) cites the unsatisfying teaching as the principal cause of the learning difficulties for students. The same students were subjects to a study by the cited authors in which they mention the principal characteristics of effective teaching:

- Enthusiasm and passion for the subject;
- Stimulation of debates throughout the classes
- Challenging students intellectually and emotionally
- Transparency and structured in presenting ideas etc.

The specialists' researches indicate a positive correlation between the teaching method and the style of learning of the students(Shulman, 1990; Tobin et al, 1994). The didactical literature

describes certain taxonomies of the teaching styles. Out of these we will stop at the classification offered by Woods (1995), who distinguishes three teaching styles: curricular, didactical and customised.

I.1. Basic principals of teaching-learning

Nowadays, in the educational sciences there have been produced many mutation, under the "pressure" of cognitive neurosciences, including the learning principals which are approached theoretically and praxiologically in diverse and complex configurations.

Traditionally, in the educational sciences, the principals of learning have been founded, practically, on the empirical paradigm, but in the current vision appeared numerous innovative dimensions, the most important ones being supplied by the paradigm of psychogenetic constructivism proposed by Piaget and by the paradigm of the development in stages of the concepts and mental operations(I.P Galperin, 1970) etc.

I.2. The X-Ray of the learning process from a cognitivist perspective

The cognitive psychology has a noticeable contribution to the understanding of the learning process, which registers in its totality to the level of the cognitive structures and not only in the actional reactions' plan. The process of learning is running through the succession of the cognitive sequences, of acquirement literally, combined organically with the metacognitive succession of monitoring, evaluationg and reglementing of cognitions(Chiş V.,2005). This dinamic between the two areas – cognitive and metacognitive is represented in the figure below (fig. 1.I).

It is a fact unanimously admitted that psychology gave the fundamentals of projecting the school's activities, together with its establishment as science. The research of the human nature, psychological development, of learning and, in general, of education led today to the outline of predilection domains of applied psychology.

I.3. The role of class climate in increasing the teaching-learning effectiveness

Classrooms are dynamic environments in which teachers and students engage in permanent and mutual interaction throughout a school-day. In literature is mentioned that when practices of effective intervensions in class are implemented(development of social, emotional and education competences), it increases the possibility of having positive teacher-student interactions and promoting learning and involvement of the student, while the problematic behaviours are diminished. On the other hand, when there is a lack of interventions in class, it is likely that the teacher-student interactions to be negative and the relationships unpreffered (even to become coercive). These kinds of interactions interfere with learning and creates a disorganzied, chaotic and even aversive atmosphere in the classroom.

There exist considerable proofs in support in emplyoing supervising and careful tracking of interventions to the whole class. For instance, it has been proven the fact that supervising and carefully monitoring lead to the reduction of the disturbing behaviours in various educational contexts, including during the training time in class (DePry and Sugai, 2002), recesses (Lewis, Powers, Kelk and Newcomer, 2002) and tranzition periods (Colvin, Sugai, Good and Lee, 1997).

I.3.1. Response to tasks' opportunities (RO)

The increase of the training rhythm through the response to academic tasks' opportunities represent a technique of questioning, encouragement or offering clues, which initiate a number of questions and answers (for example, "What number comes after 10?"). This technique grows the number of kids which give active responses, which can have as a result more correct answers and involvement of all the pupils in class (Greenwood, Delquadri and Hali, 1984).

Due to the fact that the researchers grew the RO frequency, they observed increases at the level of persistence in a task behaviour and also less disturbing behaviours (Brophy and Good, 1986; Carnine, 1976; Greenwood and others, 1984; Sutherland, Gunter and Adler, 2003). The pupils are more involved in learning and less predisposed to manifesting behavioural problems (Sutherland and others) and that it is more likely that they will give active and correct answers (Sutherland and Snyder, 2007).

I.3.3. Feedback, correcting errors and monitoring progress

Another important intervention at the class level represents giving proper feedback to the behaviour and the level of performance of the students. When used in an effective manner, feedback should:

- Help students in learning the correct answers in short time;
- To be specific to the abilities and the knowledge level of the students;
- To appear as a consequence of the student's mistake (meaning to allow an improvement of the errors).

The revising of errors procedure starts when the teacher gives a redressing model (for example, "Remember that for calculating a square's or a rectangle's surface area, you have to multiply the length with the width."). The revising model precedes the correct answer of the student, which he will have to formulate after the teacher's model (for example, "If the length of a rectangle is 5 cm, and its width is 4 cm, I multiply the length with the width and I get a surface area of 20 cm²."). The revising feedback should accompany the continuous tracking of academic or social behavioural performances (for example, the curricular evaluation), but also the training and precise and constant interventions (meaning implemented constantly).

A series of studies showed the important role of metacognitive feedback, especially in the plan of inner dialogue. For instance, in a study concerning the effects of auto-questioning (inner dialogue) in the course of solving a mathematical problem it has been observed that the students who used this kind of metacognitive feedback obtaining results significantly better in comparison with the students who did not do this (Mevarech and Fridkin, 2006).

I.4. The learning management/ self-management

Learning is a hierarchical process, cumulative type, which means that a superior type of learning is based on inferior types of learning and is extremely relevant for learning in school. In the framework of this paradigm it is considered that the hierarchical structuring of learning creates the premises of a customized "route" appropriate for each student. Hence, the most important thing is to evaluate the educational status of the student and to begin the educational intervention from that point, the fundamental concern of the teacher in this perspective being that of identifying the prerequisites of the new knowledge in order to facilitate learning.

Management, as a process of leading implies: establishment of objectives, building, employment, implementation and executing strategies concerning the streamlining and the effectiveness of the activity. The streamlining of the activities imply tracing and suppressing the

parasite components. The simultaneous employment of these components define the value and the qualities of the managers.

Independent learning or self-management means planning, tracking and evaluating respectively, cognitive and metacognitive adjustment of the learning process.

1.4.4.3. The metacognitive and self-adjusting strategies

For an optimal understanding of the learning process, we can state that metacognition signifies knowledge about knowledge and self-adjustment of the cognition, including three general types of strategies: planning, tracking and adjustment.

The planning of activities means organizing the materials and planning of the cognitive strategies in the concept of its accessibility through: establishment of goals, diagonal reading or skimming, the establishment of questions before reading the text, the establishment of the tasks' analysis of the problem.

Tracking the thinking process and the academic behaviour implies the establishment of the goals, levels of comparison for the orientation of the tracking process.

Weinstein and Mayer (2000) consider the metacognitive activities as a component part of the tracking of the understanding process. Tracking the activities include sketching and conduction the attention during the examination of the text or audition, self-testing through using questions with the purpose of verifying the understanding, tracking the understanding and employment of strategies of the test-taking in an examination situation. These strategies can prevent the attentional or understanding failures of those who learn and can be "fixed" by using revising strategies.

The inner dialogue, as a metacognitive strategy, supports the selective attention during studying, with the purpose of assimilation of features concerning the attitudes; the individual assumes for himself the ability of using the appropriate information for launching in action plans which are adapted to the self-instruction.

The mental representation as a mental process intervenes in the experiential-imaginative course, imagination which can be controlled and manipulated in a conscient manner. The imagery and practical representation techniques helps in the learning process through the development of a conceptual plan for the understanding and organizing of the task.

II. COGNITIVE AND METACOGNITIVE IN ACADEMIC ACQUISITIONS

The factors which compete for obtaining the educational/ academic achievement can be classified (Cocoradă, 2011) after the criteria of their action methods, in two big categories:

✓ *External Factors (social-didactical)* encompassing: the institutional structure of the educational system: didactical organization of the learning process; social-cultural factors.

✓ *Internal Factors (bio-psychological)* including: biological factors (for example, physical development, health condition, gender affiliation etc.); psychological factors (for example, intellectual/cognitive and non-intellectual/ non-cognitive).

From the cognitive perspective, the learning concept is synonymous with the understanding one, because the learning process means much more than producing manifestation actions, manipulated through various administrative programs of back-ups and punishments.

A new informational content triggers steps in the cognitive system, through which they produce: segregation of the environment interferences' content; the evaluation of the innovation level of information; identification of certain invariants on the base which categorize information; correlation of the new information with those already known; integration of the new information in their own basis of information; the decision of retention/ ignorance of the elements etc. These processes, because they are planned, controlled and tracked need the allocation of substantial processing resources; there are automatized processes which need a minimum volume of cognitive resources.

III. THE COGNITIVE AND METACOGNITIVE MANAGEMENT AND SELF-MANAGEMENT OF THE STUDENT WHICH IS GOING THROUGH THE EDUCATIONAL PROCESS

The self-regulating abilities are considered the most important prerequisites of independent learning (Mih, V., 2010). For the appropriation of the knowledge in the learning activity, in the higher classes, it is important the constitution of some metacognitive strategies in order to automatize it. The traditional educational system does not approach the stimulation of the strategic competences, in the sense that the set of declarative and procedural knowledge established by the professor does not aim this aspect.

Self-regulating metacognitive learning does not fit in the traditional learning process, which is focusing mostly on memorising and reproduction. We can consider that the process of self-regulating learning is an interaction of many factors – personal (motivational, strategic and self-control), behavioural and contextual – having an impact over the school performances of students (Zimmerman, 2000).

III.2. Self-regulatory learning and the levels of processing the information

The informational explosion determines the nowadays learning to optimize its strategies and methods to prepare the student to become the manager of its own learning activity. The student must be taught to be involved, to have initiative, to plan and to organize its intellectual work, to programme effectively the rhythm and time for studying, to evaluate its own activities.

According to the depth of the processing model, the memory structure is not a succession of distinct amnesiac processes, but it is structured on depth levels of processing the information. The limits of the model are given by the impossibility of establishing demarcation lines between these levels, and the level to which can an item be coded cannot be defined. In conclusion, we can say that the intensity of the cognitive activity, which aims at the depth of the content process, allows the arduous processing of them and their retention risen.

III.3. Metacognition – conceptual delimitations, theories, paradigms

The term of metacognition causes even in the present time controversies in the specialised literature, for various reasons: the difficulty of distinguishing between understanding the

knowledge terms and meta-knowledge, knowing and meta-knowing; synonymy of the terms: self-regulating, executive control, executive functions in the cognitive activity: anticipation, planning, control, meta-memorising, meta-comprehension.

The cognitive psychology defines metacognition as "the knowledge with the subject has over the functioning of its own cognitive system and those which can optimize it" (Miclea, 1999, page 323).

A Brown (1987) groups "metacognitive activities" in two categories: the conscient reflection over its own cognitive abilities and the self-regulatory mechanisms with direct applicability in learning tasks or solving problems and drawing demarcation lines between what individuals conscience about their own cognitive processes and their ability to apply the heuristic instruments with the purpose of organizing the approaching manners of the learning tasks.

In the constructivist sense, metacognition is associable with the learning style (Büchel, 2000) and can be defined as the searching for meanings, through which the one who studies gives an accumulated experience, from those which leave in the new construction, through which it differentiates of others and causes self-regulation of knowledge, of understand and solving methodology.

It is considered that metacognition represents the "articulate and flexible ensemble of knowledge which the subject has in regards with the characteristics and functioning of its own cognitive system and its capacity of using them in the sense of ensuring the optimal functioning concerning evaluation, planning, tracking and re-evaluation of the cognitive activity." (Glava, A., 2009, page 26)/

The analysis of the specialized literature specifies the domain which allowed us to try the formulation of such customized working definition, with which we will operate throughout this research:

Thus, we consider that metacognition refers to a set of knowledge – declarative, procedural and conditional, which the students have, about the functioning way of their own cognitive system and which, in relationship with a set of regulating processes – planning, tracking and evaluation, correction, replanning – aims an efficient allocation of the cognitive resources and noncognitive for increasing the efficiency of the learning activity.

IV. METHODOLOGY OF DIDACTICAL RESEARCH

"IMPLEMENTATION OF THE STRATEGIC PROGRAMME PSI-MET – EDUCATIONAL INTERVENTION CONCERNING THE OPTIMIZATION OF LEARNING THROUGH METACOGNITIVE FACILITATION"

IV.1. The premises of the research

Most of the actors involved in the educational phenomena admit the necessity of a reconfiguration of the teaching-learning process in the context in which the active, authentic, efficient and in depth learning becomes a major desiderate in the background of the actual dynamic sciences. Thus, to teach how to learn becomes a topic of importance in the present educational sciences. Starting from the emphasized premises of the self-regulatory learning paradigm, the problem of the facilitation and development of metacognitive abilities of students becomes

extremely relevant in intensifying the Romanian schools' efforts in achieving the assumed educational goal. The Romanian educational goal encompasses legal aspects of "accomplishment and personal development" (LEN, 2011) of our students and which we think cannot be realized without to essential aspects: independent learning and learning on the course of life.

If we refer to the metacognitive strategies, then we can affirm that we are referring to the adaptation of the knowledge acquired in the experience with the didactical tasks in the sense of managing the activated cognitive resources in order to achieve that task and improvement of the cognitive functioning. This invoked knowledge is labeled metacognitive knowledge and has the purpose of regulating the cognitive activity.

Recent studies emphasize the value of teaching strategies in activating the metacognitive processes as promoter of the authentic learning. Doly (1997) proposes four stages of training the metacognitions in didactical situations:

- The molding stage
- The practice stage guided by the teacher
- The cooperative-interactive practice stage
- The autonomous stage

IV.2. The purpose and objectives of the research

In this research we are aiming at investigating the teaching-learning processes in the perspective of the metacognitive facilitation strategies to students from primary cycle and gymnasium in the context of studying some disciplines from the curricular area "Mathematic and Sciences".

The general purpose of the research is that of developing the capacities of metacognitive management of the learning process, self-learning of the students through metacognitive facilitation in the teaching-learning process in the class context, of the school counselor cabinet in order for the student to strive to authentic, efficient, autonomous, independent and comprehensive learning. The metacognitive facilitation techniques are applied by the teachers who will participate at a formation programme which aims *the formation of competences of facilitating the metacognitive management of students' learning competences, in the context of teaching-learning-evaluating and in the context of activities with selected groups and in the case of students with CES*, which will be ran as follows:

1. The realization of an intervention programme on the foundation of a partnership between CJAP Bistrița-Năsăud and CCD Bistrița-Năsăud;
2. The realization of an intervention programme at "Grigore Silași" Middle School in Beclean – in the framework of the activities at the Cabinet of Didactical and Psychological Assistance;
3. The application of the intervention programme at the Inclusive Education School Center in Beclean;
4. The realization of the intervention programme by using the software application **METCOLAB** at the "Grigore Silași" Middle School in Beclean.

IV.3. The hypothesis of the research

The proposed research starts from the assumption that the metacognitive status influences significantly the school performances of the educated. Hence, the elaboration, selection and implementation at process level of teaching-learning-evaluating of some effective metacognitive facilitation of learning strategies will lead to the increasing of the metacognitive acknowledgement level, of the feeling of self-efficacy in school to the maximum value of the intellectual potential and, implicitly, to the improvement of school performances of the investigated students.

Thus, the general hypothesis assumed in the present research is that **elaborating and implementing a strategic intervention programme concerning the metacognitive abilities' development – PSI-MET – which through the maximal capitalization of the motivational-cognitive and emotional potential, in the context of conceptualizing and operating the metacognitive learning as didactical strategy, assures the premises of the metacognitive status optimization (metacognitive acknowledgement), contributing to the increase of : the metacognitive climate of the class, the metacognitive self-regulation of learning, of the level of processing and the level of comprehension of the texts, the feeling of self-efficacy and implicitly, the efficiency of learning of the middle-school pupils.**

Through the operation process of the general hypothesis we derived the next specific research hypothesis which will follow to be tested in the framework of the study:

1. After the application of the programme **PSI-MET**, the students from the experimental batch will present a significant increase at the metacognitive acknowledgment level;
2. After the application of the programme **PSI-MET-CLAS** we will state a significant improvement of the metacognitive climate of the class, in the case of the students from the experimental batch (research number 1);
3. After the application of the programme **PSI-MET-CLAS** we will state in post-test a significant increase of metacognitive acknowledgment at the teachers from the experimental batch (research number 2);
4. After the application of the programme **PSI-MET** we will state in post-test a significant increase of text comprehension at the students from the experimental batch;
5. After the application of the programme **PSI-MET** the students from the experimental batch will present a significant increased level of metacognitive self-regulation;
6. After the application of the programme **PSI-MET**, the students from the experimental batch will present a significant increased level of processing in depth the information;
7. After the application of the programme **PSI-MET**, the students from the experimental batch will present a significant increase of the metacognitive and school self-efficacy feeling.
8. After the application of the programme **PSI-MET** we will state in post-test a significant improvement of school performances in the framework of the curricular area "Mathematics and Sciences".

IV.4. The research strategy

The current step is framed in the category of *research-action* types which imply "*self-reflexive approaches and low scale interventions in the functioning of the real world, realized right by our participants to action*" (Bocoş, M., 2005). This type of research is a flexible one, facilitating planning, observing, reflection, revising, reprojecting with the aim of making the research more effective.

This type of research implies two relevant stages, one of diagnose and another which therapeutic or of intervention. The current research molds on this flexible structure, which is suited best for ecological didactical researches.

Consequently, the proposed research will have more moments or phases:

1. **The preactive phase** – which corresponds with the implementation of the intervention programmes, following that on the basis of the obtained result to be established the experimental pattern and the control pattern
2. **The interactive phase** – which corresponds with the implementation of the intervention programmes
 - a. Preparation of the teachers followed by the implementation of metacognitive strategies in the teaching-learning-evaluating process;
 - b. Individual or group coaching activities - which aims at optimizing the learning process through the use of metacognitive strategies;
 - c. Individual or group coaching activities – which aims at optimizing the learning process through the use of metacognitive strategies for the CES students;
 - d. The use of **NTIC** – in the development and optimizing the metacognitive strategies in the learning process;
3. **The post-active phase** – which include the post-test given to the subjects from the investigated patterns and the analyzation and interpretation of the obtained results.

IV.4.1. The design of the research

For this research we opted for a multi-factorial, inter-subjects design (table IV.1).

Table IV.1. The design of the research

		INVESTIGATED PATTERNS		Testing STRATEGY	Observations/ conclusions
		EXPERIMENTAL E (E1,E2,E3)	CONTROL (C1)		
School Performance (results of the applied tests) R		R,e	r,c	Inferential	Significant/ Insignificant differences
		The whole pattern (E+C)			
		Good school results R(1)	Weak school results R(2)		
Metacognitive acknowledgment (M)	Increase d m1	M1r1	m1r2	Inferential	Significant/ Insignificant differences
	Reduced m2	M2r1	m2r2	Inferential	Significant/ Insignificant differences
Self-efficacy a (A)	a1	a1r1	a1r2	Inferential	Significant/ Insignificant differences
	a2	a2r1	a2r2	Inferential	Significant/ Insignificant differences

IV.5. The system of the methods and instruments used in the research

A. Questionnaire addressed to the teachers – in the course of the research we elaborate an instrument of asking for the opinion of the teachers starting for the operational concepts and the objectives of the proposed research;

B. Questionnaires and psychological inventory – in the process of the research we translate, adapt and validate more psychological instruments of investigation of the metacognitive phenomena, but also some which are aimed at the metacognitive climate of the class or investigating instruments of the social-cognitive self-conceptualization structures (for example, self-efficacy). The evaluation of the metacognitive abilities targeted the use of two categories of instruments: "online" (which is administrated in sync, during the learning process or solving the exercise) and "offline" (which is not administrated in sync, before or after the learning/implementation process). Hence, in the framework of the four studies, we will use the following evaluating instruments, integrally or extracts of these instruments according with the type and the objectives of the intervention programme, but also with the characteristics of the investigated pattern"

- 1. The metacognitive awareness inventory (adaptation Metacognitive Awareness Inventory, annex 1a) version for students and teachers (used with permission, annex 1b);**
- 2. The metacognitive orientation scale (MOLED – S, annex 2) – a scale which aims the metacognitive orientation in class (for the area "Mathematics and Natural Sciences"), mediated by the teach- in other words it measures the metacognitive climates of the class (used with permission, annex 3b);**
- 3. Student Metacognition Self-Efficacy and Learning Process Inventory – S (SEMLI-S annex 3a) (used with permission, annex 3b)**
- 4. Questionnaire of self-efficacy for learning (SELF-A, adaptation annex 4a) (used with permission, annex 4b);**
- 5. Metacognitive Rating Scale (M.R.S, annex 5a) – version for teachers and students (used with permission, annex 5b);**
- 6. Metacognitive of Reading Strategies Awareness Inventory (MARSI, annex 6a), (used with permission, annex 6b);**
- 7. Inventory of Metacognitive Self-regulation (IMSR, annex 7a) (used with permission, annex 7b);**
- 8. Deep and Shallow Processing Strategies Questionnaire (DSPSQ, adaptation, annex 9).**

V. Results and discussions

The research had four sections, starting from the premises according to which the introduction of explicit metacognitive integrators in the framework of the learning process for middle-school students will lead to the increase of the metacognitive awareness and implicitly to the school performances of the students.

As an effect, there were organized four situations in which the middle-school students were exposed to different conditions, which targeted the metacognitive facilitation of the learning process as it follows:

- Exposure to metacognitive integration through metacognitive facilitation techniques of the learning process in the class context;
- The learning management through metacognitive facilitation techniques in the context of didactical and psychological coaching activities;
- The learning management through metacognitive facilitation techniques in the context of didactical and psychological coaching activities for the students with CES;
- The learning management through metacognitive facilitation techniques in the context of an activity which was mediated by the METCOLAB application software.

After the analysis and the interpretation we concluded in accordance with the hypothesis of the research the following:

Hypothesis no.1. After the application of the programme PSI-MET the students from the experimental batch will present a significant increase of the level of metacognitive awareness.

The data obtained after the implementation of the statistical tests allowed the rejection of the nule hypothesis, the recognition of the specifin hypothesis, conferring the differences noted to the effects of the realized intervention.

Thus, the measurements performed in the pre-active and post-active stages revealed the fact that the students of the teachers who were participating at the formation course became more aware metacognitively compared to the students whose teachers did not participate at the formation course. This conclusion demonstrates the fact that the metacognitive abilities can be developed effectively in the context of class activities. Furthemore, it demonstrates the fact that the teachers can have a major contribution in the development of these abilities through the realization of critical analysis of the courses together with the analysis of the contents which will be taught to identify the nodal points of the lesson in which there are introduced explicit elements of metacognitive nature. These elements serve as a model to the student who are participating at the lesson and their reiteration will lead to the tranzition to the inner language, thus leading even further to a more striking metacognitive awareness.

Thus, the students from the experimental batch have guideline which are superior to the students coming from the control batch concerning the aspects which are about the awareness of the level of declarative, procedural and conditional knowledge and we consider that the PSI-MET programme significantly influences the general metacognitions, which are not specific to the science domain.

Nevertheless, the quantitative analysis of the result revealed to us a significant increase of the metacognitive awareness of the middle-school pupils in all of the 4 contexts of the programme PSI-MET.

Hence, we can affirm that the program PSI-MET leads to a significant increase of the metacognitive awareness of all the student categories from the experimental batch including the pupils with CES, aspect which, we will see in the following, influences the school results as well.

Hypothesis no.2 After the application of the program PSI-MET-CLAS we will state in posttest a significant improvement of the metacognitive climate of the class, in the case of the students from the experimental batch(research no.1).

The data obtained after the implementation of the statistical tests allowed the rejection of the null hypothesis, the recognition of the specific hypothesis, conferring the differences noted to the effects of the realized intervention.

Investigating the metacognitive climate of the class at sciences measures with MOLES-S we could see a significant increase of the specific indexes of the metacognitive climate of the class in the „perception” of the students from the experimental batch in comparison with ”evaluation” of the students from the control batch. Consequently, the indexes grew significantly in report with:

- The metacognitive type demands at the level of the class which implies, molds and demonstrates the metacognitive steps but also questions connected with the difficulties faces, of the solutioning mode of the learning tasks or the new demands concerning the learning strategies;
- The facilitation and encouragement of the metacognitive communication student-student – targeting the cooperation tied to the way of learning/ solutioning problems, from when and how they learn to finding new learning strategies;
- The facilitation of the communication between student-professor – tied to the way in which the students learn, specific strategies or reasonings, connected to the way of operations and performances, and the way in which they can improve their performances;
- ”The voice” of the student – meaning in questioning the teacher when the lesson is not understood, or he does not know what to do, or regarding activities he does not understand.
- The distributed control at the level of the class – the involvement of the students in the decisions regarding why do they learn, picking the activities, do-overs or the opportunity to move on;
- The metacognitive support – informational of the teacher – encouragement of new learning techniques;
- The emotional support of the teacher – equal distance and fairness, the recognition of the efforts, respecting the ideas of the student, respecting the individual differences, trust in the teacher, etc.

In this way, the teachers who participated at the formation course succeeded to apply in the context of the class techniques and methods of metacognitive facilitation, but also techniques of ”metacognitive” management of the class which focused especially on the communication methods student-student, student-teacher and also the demands and the tasks in the metacognitive type. The teachers who participated became more supportive with the students from the informational support point of view but most of all under the emotional support point of view. The teachers who participated succeeded to catch the true meanings of the saying ”to teach how to learn”, translating it in a more operational saying ”to teach the students how to learn effectively”.

Hypothesis no.3 .After applying the programme PSI-MET-CLAS we will state in post-test a significant increase of the metacognitive awareness at the teachers who took part of the experimental batch(research number1).

The data obtained after the implementation of the statistical tests allowed the rejection of the null hypothesis, the recognition of the specific hypothesis, conferring the differences noted to the effects of the realized intervention.

Also, we stated that in the framework of the research there was a significant growth of the metacognitive awareness of the teachers participating at the formation course. So, we consider that, on the one hand, it is due to the participation at the course and on the other hand, because of the elaboration of the didactical scenarios which include explicit metacognitive aspects which the teacher verbalizes during the lesson. These led to the significant increase of the metacognitive awareness in the case of the teachers from the experimental batch.

Hypothesis no.4. After applying the programme PSI-MET we will state in post-test a significant increase of the text's comprehension of the students from the experimental batch.

The data obtained after the implementation of the statistical tests allowed the rejection of the nule hypothesis, the recognition of the specifin hypothesis, conferring the differences noted to the effects of the realized intervention.

Another aspect investigated by us refers to the metacognitive aspects tied to the understanding of the texts, for which we used the MARSII test effecting measurement with this instrument at all the investigated patterns.

The conclusions which were set during the analysis of the data revealed the fact that the programme PSI-MET determined the increase of the level of the use of metacognitive strategies regarding the understanding of the texts at all the investigated groups, including the students with CES. Thus, we stated a rise of the scores which targed the use of:

- The global metacognitive strategies – connected to: defining goals and objectives, seeking of strategies which improve the understanding, reflections concerning the content of the lessons, proof-reading of the lesson to the see the volume and to organize it etc. ;
- The solving of problems strategies – in the case of difficulties in understanding the text or the tasks to accomplish, for example diminishing the lecture reading in the difficult areas, do-overs of areas which are more difficult, etc.,;
- But also of the comprehension support strategies – summarising and reflecting concerning important information, underlining or emphasizing some areas of the text etc.

In conclusion, the students who participated at the PSI-MET programme are significantly more efficient under the aspect of managing the comprehension of the text comparing it to their colleagues from the control batch.

The interventions' effects manifests in the area of the lecture strategies and in the cases of the students with CES investigated under the aspect of global strategies and also over the ones concerning solving the problems and the support strategies.

An important aspect to tell in the case of the students with CES referes to the noticeable differences comparing them with the non-CES students in the sense that in average, the students with CES obtain inferior results at the MARSII test indiferently of the batches they come from. This observation confirms the constant difficultlies of the pupils with CES in the lecture strategies' plan, associated with reduced levels of comprehension.

Hypothesis no.5. After applying the programme PSI-MET the students from the experimental batch will present a significantly increased level of metacognitive self-regulation.

The data obtained after the implementation of the statistical tests allowed the rejection of the nule hypothesis, the recognition of the specifin hypothesis, conferring the differences noted to the effects of the realized intervention.

Using the inventory of metacognitive self-regulation(IMSR) which is considered to be an option of measurement of the metacognitive awareness and using the metacognitive strategies we tried to catch the level of metacognitive self-regulation of the learning process. The tool was specially created for the teachers to succeed in identifying the strong and weak points of the students concerning the metacognitive abilities.

The data obtained and analyzed from a statistical point of view led us to the conclusion that, after the intervention was realized, there have been some aspects from the metacognitive self-regulation which significantly improved, such as:

- Understanding their own cognitive abilities and the ways in which they perform the best;
- Adequate understanding of the problems before starting to resolve or study it;
- Dividing the problem in sub-activities and tracking the learning strategies and their finality;
- Checking the result to evaluate their performance.

Hypothesis no. 6. After applying the programme PSI-MET the students from the experimental batch present a significantly increased level of Deep information processes.

The data obtained after the implementation of the statistical tests allowed the rejection of the nule hypothesis, the recognition of the specifin hypothesis, conferring the differences noted to the effects of the realized intervention.

The questionnaire about the Deep and Shallow Information Processes used by us tries to emphasize the typical processing strategy of the one who studies considering that a deeper processing is associated with superior school results.

In accordance, in the processing strategy plan we stated that it increased significantly, in the case of middle-school pupils from the experimental batch in the case of Deep information process. The PSI-MET programme lead to the awareness by students of the relationship between the depth of the learning process and the obtained results.

In conclusion, starting from the premises that the one who learns through the metacognitive processes evaluates the "difficulty" of the learning task in the framework of the planning stage, he realizes an estimation of the cognitive, temporal "costs" and selects the learning/adequate informational process strategy, which can be shallow or deep. Thus, we consider that between the allowance of cognitive resources and the allowance of the strategy there is a functional unity and they are in an inter-dependent relationship.

Hypothesis no.7. After applying the programme PSI-MET the students from the experimental batch present a significant increase of the metacognitive and schools' self-efficacy feeling.

The data obtained after the implementation of the statistical tests allowed the rejection of the nule hypothesis, the recognition of the specifin hypothesis, conferring the differences noted to the effects of the realized intervention.

Another category of dependent variables refers to the metacognitions specific to each domain, aspects measured with SEMLI-S.

The data obtained revealed the fact that the programme realized, PSI-MET led to the significant increase of the metacognitive competences specific to the domain at all the investigated students and in all the investigated particular situations, at the level of the class, in the framework of the coaching activities with the normal student and mediated by the software application for this purpose (METCOLAB).

As an effect, we can affirm that in all the experimental situations investigated, the programme PSI-MET led to significant improvements of the students' results from the experimental batch on the following dimensions:

- The risk of learning – the investigated students succeeded in evaluating better the risk of learning;
- The attentional control- concerning the attentional focus and allowance of cognitive resources for the better realization of the learning task;
- Constructivist connections – much more careful to the pupils from the control

All these aspects have been attributed in the case of the experimental batch to the effects of the intervention realized by the teacher in the context of the students' class.

Another aspect in relation with the metacognitive abilities is the school self-efficacy, evaluated with the SELF test. In the theory part, we described the relationship between metacognitions and school self-efficacy and the way in which they both inter-condition each other. The data obtained allowed us to conclude that the programme PSI-MET has a significant positive influence also on the level of school self-efficacy. It could be observed during the research the fact that the students from the experimental batch became more confident in their capacities of solving the school tasks just because their level of metacognitive competences grew and led to the increase of the knowledge over the cognitions (declaratives) and some cognitive and metacognitive strategies (procedural).

The development of the metacognitive capacities of planning, tracking and evaluating the cognitive processes implied in the school tasks leads to the increase of the school self-efficacy feeling at the students from the experimental batch.

Hypothesis no. 8. After applying the programme PSI-MET we will state in post-test a significant improvement of the school performances in the framework of the curricular area "Mathematics and Sciences".

The data obtained after the implementation of the statistical tests allowed the rejection of the null hypothesis, the recognition of the specific hypothesis, confirming the differences noted to the effects of the realized intervention.

The last aspect investigated during our research targets the school performances of the students from the two batches (the experimental and control one). Our conclusions led to the certainty – at least at the selected pattern level- through the statistical analysis realized that the programme PSI-MET led to a significant increase of the school performances in both disciplines in the framework of the curricular areas "Mathematics and Sciences" in the both investigated groups.

Finally, we can conclude the following, the programme PSI-MET led to significant improvements in the following dimensions:

- Cognitive- under the aspect of relationships between the cognitive strategy and the results obtained – the level of informational process.
- Metacognitive – the development of metacognitive abilities of general and specific planning, tracking and evaluating, optimizing the relation EOL, allocating cognitive resources, fact which leads to an efficientization of the learning process of self-evaluation.
- Self-knowledge – increasing of the auto-efficacy and trust in their own resources
- School results – significant growth in the school results of the investigated disciplines.

In conclusion, we can certainly affirm the fact that our research demonstrates utility and the opportunity of the teaching-learning optimization through the metacognitive facilitation of middle-school students.

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