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DEVELOPING THE LEVEL OF METACOGNITIVE AWARENESS OF STUDENTS WITH LOW ACADEMIC PERFORMANCE.PILOT STUDY CONDUCTED IN THE ONLINE LEARNING ENVIRONMENT

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Abstract: The aim of the study is to highlight the efficiency of a program of activities implemented to develop the level of learning metacognitive awareness of students with low academic performance. The study was conducted on a total of 28 students from the Faculty of Social Humanistic Sciences, University of Oradea, Romania, equally divided into two groups, experimental and control. The didactic strategy used for the experimental group used tools of the mind in activities having the role of support learning for the coursebook content units of Theory and Methodology of Teacher Training. The entire program of activities took place outside classes and seminars, in online. The research tool was Metacognitive Awareness Inventory, validated on the Romanian population by A. Glava, having a number of 53 items. The research findings partially validate the research hypothesis. The program of activities contributed to the improvement of the level of metacognitive awareness of the students in the experimental group, in the posttest stage as compared with the pretest. In the intergroup comparisons, in the posttest, there were statistically significant results only for the Information Management Strategies subscale, with higher mean values in the experimental group. The research findings emphasize the need for an active involvement of teachers, managers of universities in identifying and using teaching strategies to support students with low academic performance in learning, to reduce their risk of dropping out.

Key words: metacognitive awareness, tools of the mind, online learning, university dropout

1. Introduction

During the pandemic, a number of studies were conducted to identify teaching strategies that increase the level of student involvement and motivation in the online educational process. Although the educational goals set for the teaching, learning, and assessment activities have remained unchanged from pre-pandemic times, a number of issues have required special attention from teachers and school managers, such as: "How can we help students with poor academic performance and at risk of dropping out?". This hereby research shows the efficiency of some tools of the mind used in online learning activities with students with poor academic performance in order to improve the metacognitive awareness skills.

Metacognition is the articulated and flexible system of knowledge that a person has about the characteristics and functionality of his/her own cognitive system and his/her own ability to use this knowledge for its optimal cognitive functioning (Glava & Glava, 2011). In educational contexts, metacognition is used to explain the process by which students learn to understand their thinking, with

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the help of the idea that if they can regulate their thinking effectively, this will cause them to be better students (Perfect & Schwartz, 2002 cited in Jiang, Ma & Gao, 2016, p. 403).

Field studies underline the role of metacognitive strategies in: developing the skills to understand a text or a learning context (reading comprehension) (Çubukcu, 2008; Channa, et al., 2015; Eilers & Pinkley, 2006; King, 1991; Zhussupova & Kazbekova, 2016), learning their mother tongue or a foreign language (Carrell, Pharis & Liberto, 1989; Rahimi & Katal, 2012), learning mathematics (Du Toit & Kotze, 2009; Goos & Galbraith, 1996) or developing self-directed learning skills (Shannon, 2008). In addition, researchers believe that metacognitive engagement is the key to developing a deeper conceptual understanding of scientific ideas (e.g., Anderson and Nashon 2007; Wang & Chen, 2014). Therefore, different methodological context was taken into account in the educational practices field, ones that could lead to student metacognitive development, such as: project and reflection methods (Glava & Glava, 2011), critical thinking (Ku & Ho, 2010), play-based learning (Kim, Park & Baek, 2009) or problem solving (Downing et al., 2009). Avargil, Lavi and Dori (2018) sum up the results of applied researches that used metacognition-based pedagogical intervention in some science field disciplines. Their conclusion: there is little research to provide examples of good practices that can be used to improving students' level of metacognitive awareness. That is why further research in this area is needed. In the teaching and learning process, both teachers and students need to use teaching strategies that increase the efficiency for classroom activities.

Our research follows the direction of applied researches, its objective is to develop students' metacognitive awareness through the use of tools of the mind in the assimilation of learning contents of the coursebook. Our strategy focuses on the use of tools of the mind in lectures and in learning activities related to coursebook units. The learning support activities of the intervention program were performed online, outside the usual classes and seminars, with students with low academic performance in previous semesters and at high risk of dropping out. The use of tools of the mind in teaching and learning is based on the idea that the success of students in contemporary society requires not only basic knowledge and skills, but also the ability to engage in more complex intellectual activity (Newmann, Bryk & Nagaoka, 2001). However, many students have difficulties in monitoring reading comprehension (Baker, 1989, cited in Israel et al. 2015). Learners do not know how to make use of the information to the fullest, doing a passive reading of the content, thus getting a much too small amount of knowledge or retaining it only for a short period of time (Cerghit, 2006).

In order to practice and develop metacognitive regulation behaviors, the research activities used a series of tools of the mind necessary in learning a study material. Taking into account the existing recommendations in the field bibliography (eg Agarwal & Bain, 2019; Kaplan et al., 2013; McGuire & McGuire, 2015, Negreț-Dobridor & Pânișoară, 2008), the activities included in the program aimed at:

- monitoring the level of understanding learning contents: *Strategy 3-2-1, Read-Ask-Paraphrase (RAP) method, Cube method*;
- organizing the learning material: *Mind Map*;
- interlacing information: *Brain dumps, Two things method, The Lightning Round Strategy method, Retrieval Cards method*.

For example, on the topic "Learning Objectives", one of the learning sequences was the RAP (Read-Ask-Paraphrase) method. It is used in reading the text, understanding and processing ideas; there are three stages: 1. Read – reading the course; 2. Ask – asking questions and providing answers regarding the content of the text; 3. Paraphrase - paraphrasing the text using own words. Another tool of the mind we used is Retrieval *cards*. Students receive a sheet of paper divided into 8 boxes. Each box contains a question about a term / concept to be defined. Step 1: students analyze their own knowledge before writing down ideas. If they can define the term on the paper, they draw a star in the box and if not, or if they are unsure, they put a question mark in the box. At this stage, students assess their own level of acquisition in learning by answering the question *"Do I know it or not?"*. Step 2: students go back to the boxes marked with a star and, without the help of course materials or notebooks, they write the answers, the information they know about the topic. Step 3: Students turn their attention to the boxes with the unknown topics (the ones with the question mark). To complete them, they use the

coursebook or the notebook. Step 4: Students return to the boxes marked with asterisks and check whether they have applied step 2 correctly, using the course materials and notes.

Although this study does not intend to further detail the aspects of the tools of the mind used in learning support activities for students in the experimental group, it still has to answer the research question in the following sections, i.e. "Can students' metacognitive awareness be developed through the use of tools of the mind in online learning activities?".

2. Method

2. 1. Research goal

The research goal is to underline the efficiency of the use of tools of the mind in teaching-learning activities in online to develop the metacognitive skills of students with low academic performance.

2.2. Research hypothesis

The systematic use of tools of the mind in teaching-learning activities in online leads to the acquisition and development of metacognitive skills of students with low academic performance.

2.3. Participants

The study was conducted on a number of 28 students from the first and second year, enrolled in the study program of Pedagogy of Primary and Preschool Education, Faculty of Social Humanistic Science, University of Oradea. They were evenly divided into two lots, experimental and control. The selection of the reseach participants was made according to the level of academic performance, as measured by their scores in the previous academic year in the Science Education field subjects.

2.4. Research method and tool

We used in this study the questionnaire-based survey as research method. The research tool was the *Metacognitive Awareness Inventory* developed by Schraw and Dennison (1994), translated, adapted and validated on the Romanian population by Glava (2009). The inventory consists of 52 items organized into 8 subscales: 1. *Declarative knowledge* (e.g. I easily remember what I have learned); 2. *Procedural knowledge* (e.g. I try to use working strategies that have proven effective on other occasions); 3. *Conditional knowledge* (e.g. I know in which situations the learning strategies I use are the most effective); 4. *Planning* (e.g. I organize my time to make sure I achieve my goals); 5. *Monitoring* (e.g. I constantly revise what I have learned because it helps me make important correlations between information); 6. *Information management* (e.g. I use drafts, drawings or plans to better understand what I am learning); 7. *Correction of errors* (e.g. I ask for help when I do not understand something); 8. *Assessment* (e.g. When I have completed a work task I can assess how well I did).

The first three subscales are related to metacognitive knowledge, while the next five, to metacognitive control. Filling in the answers involves choosing a suitable variant from those offered on a 5-level Likert scale: 1-never, 2-rarely, 3-sometimes, 4-most of the time, 5-always.

2.5. Stages of the psycho-pedagogical experiment

The pretest was conducted in March 2020 by administering the research tool, and the postest in June 2020. The study itself took place between April and May 2020, and it consisted in carrying out seven teaching-learning activities of learning contents in Theory and Methodology of Teacher Training academic subject. The topics were: Didactic normativity, Objectives of the educational process, Didactic methodology, Forms of organizing the educational process, Lesson –a basic form of

organizing the educational process, Lesson planning. The activities were performed outside the classes and seminars, and were aimed at using tools of the mind to improve the behaviors of planning, monitoring and control of learning of students with low academic results. The methods used concern issues relating to:

- monitoring the level of understanding learning contents: *Strategy 3-2-1*, *Read-Ask-Paraphrase (RAP) method, Cube method*;
- organizing the learning material: *Mind Map*;
- interlacing information: *Brain dumps, Two things method, The Lightning Round Strategy method, Retrieval Cards method.*

2.6. Procedure

The questionnaires was filled in online, after the presentation of the instructions. The selection of the participants in the experimental group was done on the criterion of the low academic performance in previous semesters in Science Education field subjects, and at high risk of dropping out.

3. Results

Taking into account the research goal and hypothesis, in the following section we are going to underline the level of metacognitive awareness of the research participants, of both lots, in the two stages of testing. Due to the small number of participants and the asymmetrical distribution of data, verified with the Kolmogorov Smirnov sample, the research analysis was carried out using nonparametric samples, on independent and on paired samples.

At the pretest stage, there were no statistically significant differences for the two lots, neither in the total score of the research instrument, (Mann-Whitney U= 75,50, p>.05), nor on the subscales.

To assess the efficiency of the use of tools of the mind to improve learning metacognitive awareness skills, there were made intergroup comparisons in posttest. Table 1 shows the results for the intergroup comparisons, in pretest and posttest, at each of the subscales of the research tool.

Table 1. *Results for the Metacognitive Inventory for the experimental and control groups in pretest and posttest*

Subscale	Group	N	pretest			posttest		
			Mean	s.d.	W	Mean	s.d.	W
Declarative knowledge	control group	14	3.921	0.351	75.50	3.851	0.351	96.50
	experimental group	14	3.591	0.480		3.931	0.465	
Procedural knowledge	control group	14	3.714	0.518	101.00	3.732	0.523	75.50
	experimental group	14	3.732	0.346		3.946	0.530	
Conditional knowledge	control group	14	3.800	0.477	71.00	3.800	0.477	73.00
	experimental group	14	3.614	0.480		3.971	0.592	
Planning	control group	14	3.624	0.448	96.00	3.603	0.464	61.50
	experimental group	14	3.756	0.386		3.919	0.488	
Information management strategies	control group	14	3.750	0.290	71.50	3.757	0.295	35.500*
	experimental group	14	3.914	0.328		4.243	0.413	
Monitoring	control group	14	3.613	0.486	61.00	3.674	0.473	105.000
	experimental group	14	3.388	0.452		3.621	0.323	
Correction of errors	control group	14	4.114	0.455	61.50	4.100	0.442	71.500
	experimental group	14	3.871	0.455		4.329	0.455	
Assessment	control group	14	3.785	0.491	75.50	3.785	0.491	96.500
	experimental group	14	3.524	0.539		3.821	0.366	

**p<.05*

The data in Table 1 point out that at the posttest stage, in intergroup comparisons, there are statistically significant differences only for information management strategies subscale.

At the pretest stage, the research data shown in Table 1 point out:

- the level of metacognitive skills of the students included in the study is above the average mean level, with values between m = 3,388 (at the monitoring subscale, for the experimental group) and m = 4,114 (at the subscal correction of errors, for the control group);
- there are slightly higher mean values for the control group as compared to the experimental one, at five of the subscales of the research tool (declarative and conditional knowledge, error correction, monitoring, evaluation). For the experimental group, as compared to the control one, slightly higher mean values are present at three of the subscales (procedural knowledge, planning, information management strategies). However, the differences are not statistically significant.

At the posttest stage, the research data shown in Table 1 point out:

- higher mean values in the subscales, for the experimental lot, as compared to the pretest stage. However, there were statistically significant results at the intergroup comparisons, in posttest, for the Information Management Strategies subscale, with a higher mean value for the experimental group (m=4,243) compared to the control one (m=3,674).

For an easier visualization of the data we present Figure 1.

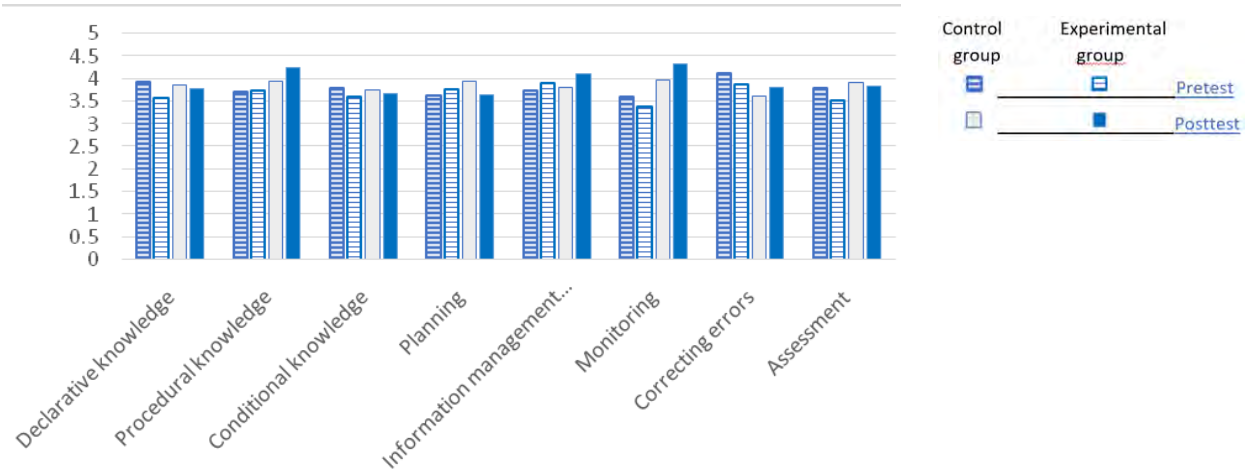

Figure 1. *Mean values at the metacognitive inventory subscales for the experimental and control group, in pretest and posttest.*

Table 2 show the results at the intragroup comparison, for the experimental group, in both stages of testing, at the overall score of the *Metacognitive Awareness Inventory*.

Tabel 2. *Results at the intragroup comparison of the metacognitive awareness level, for the experimental group (overall score).*

Variable	W	p
Metacognitive awareness level (overall score)	45.5	0.022

There were statistically significant differences at the intragroup analysis for the experimental group at the overall score of the scale (Mann-Whitney U=45.5, p<.05), thus validating the research hypothesis. Higher mean values were present in the posttest stage (m=206,857, s.d=17,702) as compared to the pretest (m=191,357, s.d=17,702).

4. Conclusions

This hereby research follows other research studies in the field of education which underline the efficiency of effective teaching strategies in learning, with groups of students, in online education. There are a number of recommendations and exemples of good practices to increase the level of students' involvement of in learning, such as: adapting teaching methods to the needs of the current generation of students – millennials – (see Muntean, 2021; Bochiș, 2021), to the particularities of the adult student generation (see Laurian-Fitzgerald et al., 2018, 2021) or to certain psychological dimensions that make up the personality of the students (see Bochiș, Barth, & Florescu, 2022); the use of film sequences in teaching and learning activities (see Barth & Ciobanu, 2017; Bochiș, Barth & Florescu, 2022, Cuc & Florescu, 2020); the use of humor in teaching (see Laurian-Fitzgerald & Fitzgerald, 2020) and others.

Considering the research findings, we also stress the need for an active involvement of teachers, managers of higher education institutions in identifying and using teaching strategies to support/help students with low academic performance in learning to reduce the risk of dropping out. Thus, we underline the importance of using self-regulated learning to increase the level of students' metacognitive awareness, i.e. in the use of information management strategies. The results of the comparative study on paired samples in the posttest reveal that the students in the experimental group have higher mean values at the subscales of the research instrument in the posttest as compared to the pretest. These data allow us to state that the set of activities implemented at the experimental group level were efficient for their metacognitive awareness level. However, in intergroup comparisons, in the posttest stage, there were statistically significant values only at the Information Management Strategies subscale, with higher mean values for the experimental group. This allows us to underline the efficiency of the implemented program especially on this component of metacognitive skills.

As a result, improving the students' metacognitive strategies can contribute to increasing their academic performance in different school subjects (see Rahimi & Katal, 2012; Carrell, Pharis & Liberto, 1989; Du Toit & Kotze, 2009; Goos & Galbraith, 1996; Avargil, Lavi & Dori, 2018). Thus, we recommend that teachers engage in explicit teaching of the different components of metacognition and their usage in didactic activities, starting from specific learning contents.

References

Agarwal, P.K., Bain, P.M. (2019). Powerful teaching: unleash the science of learning. San Francisco: Jossey Bass

Anderson, D., & Nashon, S. (2007). Predators of knowledge construction: Interpreting students' metacognition in an amusement park physics program. Science Education, 91, 298–320.

Avargil, S., Lavi, R., & Dori, Y. J. (2018). metacognition and metacognitive strategies in science education. Cognition, metacognition, and Students' culture in STEM Education, 33-64.

Bochiș, L. N., Barth, K. M., & Florescu, M. C. (2022). Psychological variables explaining the students' self-perceived well-being in university, during the pandemic. Frontiers in Psychology, 727. https://doi.org/10.3389/fpsyg.2022.812539

Bochiș, L.N. (2021). Psychopedagogy of People with Intellectual Disability. Landmarks on the management of online academic course during the pandemic. Volume II: In the virtual class. Chișinău: Lambert Academic Publishing

Carrell, P. L., Pharis, B. G., & Liberto, J. C. (1989). Metacognitive strategy training for ESL reading. TESOL quarterly, 23(4), 647-678.

Cerghit, I. (2006). Metode de învățământ [Teaching methods]. Iași: Polirom Publisher House

Channa, M. A., Nordin, Z. S., Siming, I. A., Chandio, A. A., & Koondher, M. A. (2015). Developing reading comprehension through metacognitive strategies: a review of previous studies. English Language Teaching, 8(8), 181-186.

Çubukcu, F. (2008). How to enhance reading comprehension through metacognitive strategies. Journal of International Social Research, 1(2).

Cuc, I.S., & Florescu (2020). Strategii didactice interactive bazate pe film și imagine. Percepția elevilor din învățământul vocațional pedagogic cu privire la utilizarea starategiilor bazate pe film și imagine [Interactive teaching strategies based on film and image. Students' perception from pedagogical vocational education on the use of film and image-based strategies]. In K. Barth, C.M. Florescu (Eds). Utilizarea filmului și a imaginii în educație [Using film and image in education] (pp. 119-138). Cluj-Napoca: Presa Universitară Clujeană Publisher House

Downing, K., Kwong, T., Chan, S. W., Lam, T. F., & Downing, W. K. (2009). Problem-based learning and the development of metacognition. Higher Education, 57(5), 609-621.

Du Toit, S., & Kotze, G. (2009). Metacognitive strategies in the teaching and learning of mathematics. Pythagoras, 2009(70), 57-67.

Eilers, L. H., & Pinkley, C. (2006). Metacognitive strategies help students to comprehend all text. Reading improvement, 43(1), 13-30.

Glava, C. C., & Glava, A. E. (2011). Development of metacognitive behavior of future teacher students through electronic learning diaries as means of self reflection. Procedia Computer Science, 3, 649-653.

Goos, M., & Galbraith, P. (1996). Do it this way! Metacognitive strategies in collaborative mathematical problem solving. Educational studies in mathematics, 30(3), 229-260.

Israel, S. E., Bauserman. K. L., Kinnucan-Welsch, K., & Block, K. C. (Eds.). (2005). Metacognition in literacy learning: Theory, assessment, instruction, and professional development. Mahwah, NJ: Lawrence Erlbaum

Jiang, Y., Ma, L., & Gao, L. (2016). Assessing teachers' metacognition in teaching: The Teacher Metacognition Inventory. Teaching and Teacher Education, 59, 403-413.

Kaplan, M., Silver, N., LaVaque-Manty, D., Meizlish, D. (2013). Using reflection and metacognition to improve student learning. Across the disciplines, across the academy. Sterling: Stylus Publishing, LLC

Kim, B., Park, H., & Baek, Y. (2009). Not just fun, but serious strategies: Using meta-cognitive strategies in game-based learning. Computers & Education, 52(4), 800-810.

King, A. (1991). Improving lecture comprehension: Effects of a metacognitive strategy. Applied Cognitive Psychology, 5(4), 331-346.

King, A. (1991). Improving lecture comprehension: Effects of a metacognitive strategy. Applied Cognitive Psychology, 5(4), 331-346.

Ku, K.Y., & Ho, I.T. (2010). Metacognitive strategies that enhance critical thinking. Metacognition and learning, 5(3), 251-267.

Laurian-Fitzgerald, S. and Fitzgerald, C. (2020). Make learning fun. Paper presented at the Edulearn, 12th Annual International Conference on Education and New Learning Technologies, 6th - 7th of July, 2020, Palma de Majorca, Spain

Laurian-Fitzgerald, S., Fitzgerald, C. J., Popa, C. A., & Bochis, L. (2018). The New Normal: Adult Online Learners. In C.J. Fitzgerald, S., Laurian-Fitzgerald, C.A. Popa (Eds.) Handbook of Research on Student-Centered Strategies in Online Adult Learning Environments (pp. 140-171). USA: IGI Global.

Laurian-Fitzgerald, S., Fitzgerald, C. J., Popa, C. A., & Bochis, L. (2021). The New Normal: Adult Online Learners. In Research Anthology on Adult Education and the Development of Lifelong Learners (pp. 88-120). IGI Global.

McGuire, S.Y., McGuire, S. (2015). Teach student show to learn: strategies you can incorporate into any course to Improve student metacognition, study skills and motivation. Virginia: Stylus Publishing

Muntean, L. (2021). Educaţia muzicală facelift (2020)-întrebări şi provocări. ICT in Muzical Field/Tehnologii Informatice si de Comunicatie in Domeniul Muzical, 12(1).

Negreț-Dobridor, I., Pânișoară, I-O. (2008). Știința învățării. De la teorie la practică [The science of learning. From theory to practice]. Iași: Polirom Publishing House

Newmann, F. M., Bryk, A. S., & Nagaoka, J. K. (2001). Authentic intellectual work and standardized tests: Conflict or coexistence? Chicago: Consortium on Chicago School Research.

Rahimi, M., & Katal, M. (2012). Metacognitive strategies awareness and success in learning English as a foreign language: an overview. Procedia-Social and Behavioral Sciences, 31, 73-81.

Shannon, S. V. (2008). Using metacognitive strategies and learning styles to create self-directed learners. Institute for Learning Styles Journal, 1(1), 14-28.

Wang, J. R., & Chen, S. F. (2014). Exploring mediating effect of metacognitive awareness on comprehension of science texts through structural equation modeling analysis. Journal of Research in Science Teaching, 51(2), 175–191.

Zhussupova, R., & Kazbekova, M. (2016). Metacognitive strategies as points in teaching reading comprehension. Procedia-social and behavioral sciences, 228, 593-600.

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