Self-Monitoring and Self-Regulation of University Students in Text Comprehension*

Самоконтроль та саморегулювання в процесі розуміння тексту студентами університетів**

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** Дослідження виконане за фінансової підтримки Міністерства освіти і науки України, Реєстраційний номер 0117U000683, «Метазнання в умовах індивідуального і психологічного, соціального й ситуаційного визначення».

ABSTRACT

Many empirical researches and theoretical studies of the topics regarding the interconnection of the processes of student higher education, self-regulated learning, studying motivation and outcomes, text comprehension have been executed in psychology. However, comparatively small part of them has been connected with text comprehension of the students during educational process, especially the cognitive and metacognitive aspects of it. In this article, a phenomenon of metamemory and its role in self-regulated learning and development of text comprehension skills of students have been characterized. We have determined the direction for future research of self-regulated learning and metacognitive processes in the students' text comprehension activities and their effective use in the educational process. Study of the metacognitive aspects of self-regulation and metamemory will help to improve self-monitoring and self-regulation of students' training activity in text comprehension.

The article characterizes the term of the metamemory phenomenon and its role in the process of self-regulated training and development of text comprehension skills. We have also distinguished possible directions of future researches in self-regulated training and metacognitive processes of students' activity that is connected with text comprehension as well as with their efficient usage in the teaching process. The necessity of metamemory learning and the process of knowledge transmission in the monitoring-regulation-learning cycle have been distinguished. Theoretical model of metacognitive combination of metacognitive and cognitive processes such as sense of knowledge, metamemory judgments and their categories have been investigated. The conclusions about necessity of the future advanced study of the metamemory phenomenon and students' training process self-regulation in text comprehension have been made. Possible directions of future researches in metacognition and self-regulation of university students' studying activity in text comprehension as well as their efficient implementation into the teaching process have been determined.

Key words: *Self-monitoring, self-regulation, metamemory, metacognition, text comprehension, student.*

Introduction

Many cognitive processes become active when students execute different tasks in the process of studying and reading texts. They are supposed to analyze all the words and wording, putting them in order which makes sense in the whole sentence, memorize the meaning of a few sentences in long-term memory. The metacognitive mechanisms of enabling these skills include sporadical pausing, rereading parts of the

text, analyzing whether they have been understood properly, checking the fragments and continuing reading. These mechanisms play very important role in in text comprehension by students as they enable proper understanding of the texts or parts of the texts.

Scientific interest in researching the phenomena of cognition and metacognition has increased significantly over the recent years. However, it is possible to note that mostly cognitive psychologists have researched the issues connected with their nature and relation to the student's learning process and self-regulated learning.

Self-regulated learning (SRL) can be determined as a process helping students to arrange the own emotions, thoughts and behavior for a useful learning experience, knowledge, and skills. As a rule, it includes the stages of planning, performance and reflection (Zimmerman, 2000; Pintrich & Zusho, 2002). SRL includes such main phases as goal setting (Wolters, 2011), planning (Zimmerman, 2000), self-motivation (Wolters, 2011; Zimmermann, 2000), attention control, flexible use of learning strategies (Winne, 2009), self-monitoring (Butler & Winne, 1995).

It is understood that SRL of the students should be supported and encouraged by the teachers, as these students would be much more active during studying and understanding the text material. They are more motivated and active than the other students in the classroom (Labuhn et al., 2010). Moreover, such self-regulated students usually align their own educational needs with the educational processes in the classroom. Some previous studies proved that high level of SRL is extraordinary important in student learning. The students with a greater propensity for SRL perform the reading and comprehension tasks and their evaluation more successfully (Zimmerman, 2008; Schunk & Zimmerman, 2007), make much less mistakes, achieve greater confidence and elicit higher levels of self-efficacy (Labuhn et al., 2010; Graham & Harris, 2000; Kistner et al., 2010).

In this article we aimed to execute analysis of some theoretical studies and empirical results of research of the phenomena of SRL and text comprehension in context of cognition and metacognition, which will lead to deeper understanding the processes leading to better text comprehension by the self-regulated students. One of our main objectives in this article was to critically analyze the nature of SRL and metacognitive processes in it among the students, considering

the methodological studies of these phenomena of Efklides (2012) and Koriat (2012).

Research methods

We have conducted theoretical analysis of four empirical researches of college students and school pupils regarding their text comprehension and learning tasks: understanding of key terms from reading the text from psychological books (Dunlosky & Rawson, 2012), understanding general information and being able to answer questions (Metcalf & Finn, 2012), understanding of hypertexts (Pieschl et al., 2012) and scientific texts (Redford et al., 2012).

Concepts of Metamemory and Metacognition

Scientific determination of metacognition was executed by J.T. Hart (1965) who studied metacognitive experiences and defined a phenomenon of Feeling-of-Knowing experience (FOK). The scientists defined it as a person's ability to adequately and quickly retrieve a correct answer from memory after being asked a semantic knowledge question (Hart, 1965). It is nowadays a popular research scientific topic, and a sufficient amount of articles are dedicated to it (e.g., Hertzog & Touron, 2011; Thomas et al., 2011).

The terms «metacognition» and «metamemory» were originally presented by J. Flavell (1976, 1979). By his definition, this phenomenon is characterized as any cognitive knowledge, activity or an aspect of cognitive activity. He defined metacognition as a conscious and purposeful activity, directed at reaching a specific goal.

Later on, a scientific research on this topic was continued by Nelson and Narens (1994) who worked out a general metacognitive model, which described how metacognitive cognitive processes interrelate with each other. This model was consisted of the object level (cognitions from the outside environment related to objects) and metalevel (cognitions from the object environment) (Fig. 1).

The model describes that information flows from the object level to the metalevel, when a combination of thoughts and feelings about cognitions actually happens, and this is considered to be monitoring.

The process of control or regulation can be described as adjustment of a person's behavior to the surrounding environment. For example, the metalevel finds a problem with the text comprehension

and the control process makes a student to reread a text. The metalevel is supposed to evaluate cognitions of the text comprehension and act according to them.

Fig. 1. *Metacognitive model by Nelson and Narens (1994)*

Other authors have researched connection of the monitoring to collecting and processing information from the object level, with the help of a mechanism called «metaperseption» (Van Overschelde, 2008). Another term «metamemory» is used in describing the process of studying the metacognitive aspects. In many cases, we can notice many common features in students' metamemory, but it should be noted that an amount of differences is still several times greater. It is understood that identifying the appropriate interrelation between learning, monitoring and regulation is one of the most important tasks for research the process of student learning and comprehension.

Some studies in educational psychology reveal the interconnection between the student monitoring in SRL and the learning results. According to some authors (e.g., Butler & Winne, 1995; Dunlosky & Hertzog, 1998) the needed learning outcome can be reached at the combination of learning, regulation and monitoring. During the process of studying a student should review the materials several times for appropriate monitoring of which results have been achieved and what is essential in future studying. This process continues to the moment when the current level of learning and the aimed one become equal. A particular student should study the most difficult parts of a task more, which manifested themselves the most during the work with reading and comprehending the text (Dunlosky & Hertzog, 1998).

Scientists suggest that students prefer to draw most of their attention and learn the easiest parts of the texts first, using adaptive strategies and mechanisms during managing of learning this way, and

move on to more challenging ones if they have time at their disposal (Metcalf, 2002; Metcalfe & Kornell, 2005; Balashov, 2017, 2018).

Dunlosky & Ariel (2011) recently introduced a concept of agenda-based regulation (ABR), according to which, students set a specific agenda or goal before studying, and they select material for restudying in accordance to the goal that was chosen. The authors showed that the availability of remuneration for the task increases the amount of efforts applied during restudy. As a result, ABR outlines the limits of the possibility that this phenomenon would influence the regulation process of learning.

Besides the aforementioned Feeling-of-Knowing judgment, many psychologists have considered in their researches such phenomenon as Judgments-of-Learning (JOL), which likely meant that the target material will be remembered on a later learning stage, or Ease-of-Learning judgments, which are made before the study of the material and make learners indicate if it will be stress-free to learn the material or not (Nelson & Narens, 1994). Usually a student's metacognitive activities are evaluated quantitatively with such variable as (self-) monitoring accuracy, which actually determines correlation between a student's judgment and performance. The higher is this correlation, the more likely is the student to predict the learning outcome of their own comprehension.

The main statistical method for calculating the accuracy of monitoring is the gamma correlation of Goodman-Kruskal, which ranges from -1 to 1 (Goodman & Kruskal, 1959). The indicator meaning close to 1 means high level of the monitoring accuracy and vice versa, the 0 indicator means poor monitoring activity, and a gamma leading towards -1 means very poor memorizing by the student of the items needed to be known well.

Recently, another alternative method of estimating the monitoring accuracy is being increasingly used. Some researchers calculate absolute monitoring accuracy, or the discrepancy between students' performance and JOLs (Nelson, 1996). When learning performance of students is higher than JOLs, it means that there is underconfidence, whereas the reverse situation certifies about overconfidence. However, a student may get disappointing results for the performance activity, but may have high monitoring accuracy after correct identification of the poverty of this performance.

Adequate regulation of metamemory is required for proper SRL. Therefore, we consider that most of metamemory studies have been focused on improving the weak JOLs and explaining the grounds of judgments for metacognitive monitoring. Although, correlation between metacognitive monitoring and SRL in text comprehension have been confirmed in many scientific studies (Thielde et al., 2003). For example, in Thielde's research the respondents were asked to rate comprehension of the text they were supposed to study, and choose the keywords. The respondents, who successfully chose the keywords, were much more correct in text comprehension and adjustment of their learning by restudying some parts of the text, unlike those students, who did not complete this task fully.

Dunlosky and Rawson (2012) studied the correlation between monitoring and the results of learning of students. The scientists researched that the students perform much poorer in understanding the text when they are overconfident in their own learning abilities. Therefore, a conclusion can be made that the students monitoring surely has an impact on their studying and learning.

The mentioned researches are important for the educational psychologists and educators, because they enable clearer understanding of the issues of monitoring of learning activities, SRL of students, their interaction in the classroom, thus making possible improvement in the teaching process and use of proper teaching methodologies and techniques.

Results and discussion

The main focus of the article is laid on studying the issues of Judgment-of-Learning (JOLs) and Ease-of-Learning (EOLs) of the students in the learning environment in the classroom.

Previous theoretical studies and empirical researches prove that when JOLs are being executed after pausing and not straightaway, the process of monitoring of metamemory of the students is conducted much more accurately. Koriat (2012) explained that the students had a capacity to distinguish easy and difficult parts of the text and make JOLs about the previous parts of the texts, and the accuracy of their JOLs was improving with every next attempt. Younger students had also a greater tendency to demonstrate overconfidence in memory monitoring in text comprehension than their older peers. Although overconfidence is

widespread among the students, particularly in JOLs, it reduces every following year of their learning activities.

Recently, many scientists have paid attention to the issues of metamemory development among the students. DeBruin et al. (2011) was researching the extent, to which the students were able to make prompt metacomprehension judgment of the texts. The testing showed that activation of the text comprehension with providing JOLs positively influences their metacognitive accuracy in learning activities, and the incorrect JOLs were caused by poor rating of own comprehension by the students. In this text comprehension study the authors emphasized that the students were able to connect own JOLs with the decisions about restudying.

It can be concluded that the effect of keyword generation is a metacognitive cue for metacomprehension accuracy in text learning, and that keyword generation before making JOLs has a positive effect on text comprehension by students. However, there is lack of studies and researches of the mentioned issues and metacomprehension accuracy of the students.

The researches prove that in simple text comprehension tasks, even younger students have capabilities to monitor their own memorizing activities. The use of the metamemory activating techniques is required when the complexity of text comprehension and load of the working memory of students increases. SRL of students and their learning outcomes can be positively influenced by the development of metamemory and its accurate and effective monitoring in the learning process. This would be reflected by a negative correlation between the students' JOLs and selection of the texts for restudying (Nelson et al., 1991).

Younger students are proved to have a capacity to develop their own learning regulation skills (Roebes et al., 2009). The research showed that they were capable to accurately rate own answers on the questions about the learned text and adjust owl learning behavior in accordance with withdrawing the answers they were unsure in. This was reflected in high gamma-correlation between the students' predictions and learning performance in text comprehension. They provided lower JOLs for the withdrawn answers proving adequate regulation. In most cases, these withdrawn answers were incorrect, and this proved a very

important role of the restudying process in monitoring of learning activities and SRL of students.

Finally, Vidal-Abarca et al. (2010) researched the students' SRL in text comprehension by answering questions about the texts, including reading the texts online. The authors marked several behavioral and learning indicators of the students in the process of reading the text and found out clear dissimilarities between the skilled and poor comprehenders. It was obvious from the study that the students with higher JOLs comprehended the texts better and noticed inconsistencies in the questions to the text than the poorer comprehenders. Data of the research proved that in reading the text and its comprehension the students were developing their self-regulatory skills.

The analysis allows us to draw a conclusion that the students' ability to SRL in text comprehension is not developed with monitoring skills. Moreover, monitoring skills highly depend on text features and the specificity of the provided instructions, and the students can transmit them into effective SRL. The students have more inclination to monitor and regulate own learning based on monitoring of JOLs (DeBruin et al., 2011).

New directions in further research of metacognition in text comprehension

Analysis and synthesis of studies and empirical researches of the student's metamemory in text comprehension proves some breaches in studies of this phenomenon and opens new horizons for researching some additional cognitive and metacognitive components of it.

Recently, the accuracy in the results of the empirical research has become a main task and focus in psychological science. Some scientists consider absolute JOLs to be much more important for SRL of the students than the relative ones (Boekarts & Rozendaal, 2010). Therefore, these changes in research methods and methodology are important for improving the learning process of the students. For them it is really essential in learning to distinguish the texts, which they are capable to understand, and answer questions. However, even when a student knows one text better than another, it does not automatically create the necessity to restudy these ones. Therefore, further research of cognitive and metacognitive aspects of SRL might become more suitable for improving the learning environment in the classroom.

Absolute accuracy in learning is one of the main focuses of Dunlosky and Rawson's study (2012). The authors asked students to evaluate the correctness of definitions in some parts of the text after studying them, and only half of the respondents compared own definitions with standard ones. The research also revealed that the overconfident students did not accomplish such a comparison and therefore their learning results were lower. More self-confident students did more thorough processing of the text parts with the use of the same amount of time, and this actually helped them to demonstrate better learning results. This research surely demonstrated clear evidence of poor influence of overconfidence on the learning outcomes of students in text comprehension and other learning activities.

Another issue studied by the psychologists recently is the interrelation of metamemory, learning and monitoring of students and absolute accuracy in their research (Metcalf & Finn, 2012). According to this research, the students very often could not choose the correct answer from a list and could find it only after being told that the previous answer was incorrect. They finally showed overconfidence and failed to choose the correct answer, which explained that hypercorrection did not help them. Hypercorrection determined that usually the teacher's feedback on the students' text comprehension, monitoring and SRL is more complex. These conclusions have led us to understanding that the influence and accuracy of the teachers' feedback of the metacognitive processes in the students' learning and text comprehension is crucially important.

Another issue which is becoming more important nowadays in psychological science is studying the role of hypermedia learning environment. Psychologists research metamemory and its correlation with self-monitoring and self-regulation and accentuate on its importance (Pieschl et al., 2012). Students' learning motivation and behavior was evaluated with these indicators in the hypertext learning environment. The respondents showed proper capabilities to restudying and redesigning of the own learning strategies. They correctly chose the mechanisms of SRL when fulfilling complex reading tasks. However, some discrepancies between self-monitoring and self-regulated learning and their reaction during the process of text reading and comprehension have been emphasized in the research.

Koriat (2012) describes the mentioned above type of metacognitive monitoring as data driven. According to him, every student in the process of text comprehension can make connections between the significant processes of learning performance, monitoring and regulation of learning activities. Many other scientists have tried to add an aspect of researching the role of metamemory (Boekaerts & Rozendaal, 2010; DeBruin et al., 2011; Efklides, 2012). The issue which needs to be discussed is if thinking and learning tasks will result as efficiently as in studying texts and their comprehension (Kalmykova, 2013).

Many other scientific topics have been studied in psychology such as text comprehension connected with reading the text, its comprehension, answering the questions, and rereading the text on a basis of JOLs, creating concept maps with metacomprehensive accuracy (Redford et al., 2012). Based on the experimental research, the authors drew a conclusion that active and accurate concept map creation increased their metacomprehensive capabilities in text comprehension.

Conclusions

Theoretical analysis of the empirical research focused at the issue of metacognitive aspects in text comprehension has proved actuality and novelty of these phenomena in students' learning environment. Needless to say that metacognition in learning is crucial for every student's success in education. The four studies which we have analyzed in our paper can be considered in frames of the educational process within learning metamemory. The mentioned studies emphasize that today's most important task for the modern higher education is to create a conceptual foundation and framework for successful student learning.

The role of SRL has increasingly become very important in higher schooling, especially when studying novel information and understanding its importance, reading the texts and comprehending them. Students need to have developed self-efficacy and self-regulation skills, which are needed for receiving new information, analyzing and understanding it, reflecting on its accuracy and using in learning performance. Obviously, fulfilling the reading and comprehension task, for example, requires even more metacognitive competence than a decision regarding restudying.

A number of scientists have advised that when learners are thoroughly instructed about appropriate ways of evaluating their own

learning activity and the use of this information during selection of the novel reading and comprehension task, this additional information leads to a higher efficiency in their SRL (Voloshyna et al., 2012; Pasichnyk et al., 2017). This can be proposed as a direction for possible future research of a combination the metamemory paradigm and metacognitive skills use in the cycle monitoring-regulation-learning.

Efklides (2012) considered that the role of metacognitive feelings in the process of text comprehension has been underestimated. Metacognitive feelings and judgments have been differentiated in the study. The evaluation criteria tend to be related to metacognitive judgments in the classroom. Surely, a learner's motivation to determine learning behavior and adjust to learning environment should be considered. Scientists should analyse more the affective experiences of students before and during the process of learning in the classroom in addition to metacognition aspect.

We have drawn a conclusion that it is still necessary to study in depth the phenomenon of metamemory and its role in the student's educational environment. The studies present a number of educational approaches to the process of SRL in the context of text comprehension. For theoretical analysis, on the other hand, it is obvious that studying the process of SRL and metacognitive processes during the its monitoring has been shifted from clearly cognitive psychology to the pedagogical and methodological approach to these issues.

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АНОТАЦІЯ

У психологічній науці здійснено велику кількість емпіричних і експериментальних досліджень щодо взаємозв'язку між навчанням студентів, саморегуляцією, самомоніторингом, навчальною мотивацією

і результатами навчання, розумінням текстів. Проте відносно невелика їхня частина була пов'язана із вивченням розуміння студентами текстів під час процесу навчання, особливо його когнітивних і метакогнітивних аспектів.

Аналіз довів, що акценти у вивченні саморегульованого навчання і метакогнітивних процесів у навчальній діяльності студентів переміщені від когнітивних до педагогічно-методичних підходів. Вивчення метакогнітивних аспектів саморегуляції та метапам'яті посприяло би покращенню самомоніторингу і саморегуляції навчальної діяльності студентів та розумінні текстів.

У статті охарактеризовано поняття феномену метапам'яті та її ролі у процесі саморегульованого навчання і розвитку навичок розуміння текстів. Ми також визначили можливі напрямки майбутніх досліджень саморегульованого навчання і метакогнітивних процесів у діяльності студентів, що пов'язана із розумінням текстів, а також їхнього ефективного використання у навчальному процесі. Визначено важливість вивчення метапам'яті і процесу передачі знань у циклі моніторинг-регуляція-вивчення. Розглянута теоретична модель метакогнітивного поєднання метакогнітивних і когнітивних процесів, таких як відчуття знання, метапам'яттєві судження та їхні категорії. Зроблено висновки про необхідність подальшого поглибленого вивчення феноменів метапам'яті та саморегуляції навчальної діяльності студентів при вивченні текстів. Визначені можливі напрямки майбутніх досліджень метакогнітивності і саморегуляції навчальної діяльності студентів університету у розумінні текстів, а також їхнього ефективного впровадження у навчальний процес.

Ключові слова: самомоніторинг, саморегуляція, метапам'ять, метакогнітивність, розуміння текстів, студент.

Балашов Едуард, Пасечник Игорь, Каламаж Руслана. Самоконтроль и саморегулирование в процессе понимания текста студентами университетов

АННОТАЦИЯ

В психологической и психолингвистической науке осуществлено большое количество эмпирических и экспериментальных исследований взаимосвязи между учебной деятельностью студентов, саморегуляцией, самомониторингом, учебной мотивацией и результатами обучения, пониманием текстов. Однако относительно небольшое их количество было связано с изучением понимания студентами текстов во время процесса обучения, особенно его когнитивного и метакогнитивного аспектов.

Анализ довел, что акценты в изучении саморегулируемого обучения и метакогнитивных процессов в учебной деятельности студентов смещены с когнитивных подходов к педагогико-методическим. Изучение метакогнитивных аспектов саморегуляции и метапамяти способствовало бы улучшению самомониторинга и саморегуляции учебной деятельности студентов и понимания текстов.

В статье изложена характеристика феномена метапамяти, ее роли в процессе саморегулируемого обучения и развития навыков понимания текстов. Мы определили возможные направления будущих исследований самоергулируемого обучения и метакогнитивных процессов в деятельности студентов, которая связана с пониманием текстов, а также их эффективного использования в учебном процессе. Определена важность изучения метапамяти и процесса передачи знаний в цикле «мониторинг – регуляция – обучение». Рассмотрена теоретическая модель метакогнитивных и когнитивных процессов, таких как ощущение знания, метапамятные суждения и их категории. Сделаны выводы о необходимости дальнейшего углубленного исследования феноменов метапамяти и саморегуляции учебной деятельности студентов при восприятии и понимании текстов. Определены возможные направления будущих исследований метакогнитивности и саморегуляции образовательной деятельности студентов университета в контексте понимания текстов, а также их эффективного внедрения в образовательный процесс.

Ключевые слова: самомониторинг, саморегуляция, метапамять, метакогнитивность, понимание текстов, студент.