Metacognitive strategies in reading comprehension of majors in education and psychology

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This study looks at how well students majoring in educational sciences and psychology were able to use spontaneously metacognitive strategies for reading comprehension. Students majoring in education have demonstrated ineffective learning goals and strategies. The results of the study show that only 7 percent of education majors sought to establish logical connections between the text fragments in multiple-choice assessment by contrast with 48 percent of psychology majors. The study showed that the number of education and psychology majors with metacognitive strategy of systematization has increased in the situation of self-formulated answer.

Keywords: metacognition, learning approach, multiple-choice assessment, self-regulated learning, readers' skills

Introduction

According to PISA research, in the last decades the level of the reading skills of Russian pupils has dropped and Russia has moved to the 43d place (OECD, 2010). It is considered that the effectiveness of the material comprehension depends on whether the student uses metacognition and metacognitive strategies of understanding and memorizing as well as the ability to evaluate his own understanding or not (Bransford, 1979, Brown, 1983, Iliasov, 1986).

The theory of "thinking about thinking" was first described by J. Flavell in the 1970s as metacognition. It means knowledge of one's own cognitive processes, i.e. knowledge of how one learns and acts (metacognitive knowledge), as well as control of these processes by the person who learns and acts in various situations (metacognitive regulation). D. Halpern notes that teaching skills of critical thought and strategies which enable to make understanding and memorizing easier as well as to monitor the process of learning play a special part in the refinement of working with material (Halpern, 2000). The research on metacognition has pointed out that it is a significant predictor of academic performance (Dunning et al. 2003, Thiede et al. 2003). Students with a high degree of metacognition

achieve a higher level of academic performance than those with a low level of metacognitive knowledge.

The theory of metacognition is closely connected with the concept of self-regulated learning. It is an internal management process of self-regulation, which can not be seen as a personality trait, nor as a specific skill. The student guided by the knowledge of his personality uses the necessary strategies of learning. Learning in this sense is not something that is aimed at students, but something that comes from students themselves. The components of self-regulated learning are motivation, self-efficacy, metacognition and attribution (Boekaerts, 2002). J. Lennon (2010) summarizes common contents of various definitions of self-regulated learning into the following two points:

1. Students are aware of the self-regulation process and its potential use in improving their performance. This means that the process of self-regulation is a conscious one.
2. Students generate their own feedback on their learning. Students monitor the effectiveness of their methods of learning strategies (Lennon, 2010).

It is necessary to mention that the psychology of self-regulation developed by the Russian school of psychology also pays attention to "cognition about cognition". A. Karpov, basing on activity paradigm, describes metacognitive level as the highest level of a person's activity regulation (Karpov, 2011).

The problems of metacognition are also considered by investigators, who distinguish different ways of learning approaches: "superficial" and "deep". The first (a "superficial" style) is characterized by a desire to remember the material, while the second (a "deep" style) — by a desire to use metacognitive strategies in reading comprehension, to assimilate the knowledge from experiences, to monitor the effectiveness of understanding (Entwistle, 1997). In other words, the generalized idea of what is to learn a certain type of information, determines the settings and the students' choice of methods of working with educational material, which naturally affects the quality of its mastering.

From our point of view, it is important to take into account how different approaches to learning depend on the requirements to students. An important factor is the knowledge control, which is one of the requirements determining goals and strategies of mastering the material. Let us consider one of such kinds of control.

Recent educational reforms in Russia have introduced multiple-choice tests into teaching practice at every level of elementary, secondary and higher education. This assessment method has become predominant and very popular in our country. Test results are served to measure schools' and teachers' efficiency. In terms of preparing students for testing, teachers focus more on drilling students on the right answers rather than working on the content. As a result, students subconsciously begin to orient themselves to memorizing and recognizing the answers. Such concentration on strategies of recognition and random choice is known to be one of the drawbacks of multiple-choice testing (Tuckman, 2002).

There is a description of such phenomenon in the psychology of memory, it is called a "feeling-of-knowing" (Mesheryakov, 2004). It is one of the forms of metamemory, when one can't give the right answer on his own, but can recognize it in the given list or pick up a plausible answer. In a situation of multiple-choice test

students can be divided into two groups. Having got the question some students try to formulate the answer on their own (which requires a high level of knowledge), and then select one of the options. Other students, who are not able to generate the solution, choose the answer by casual sorting or recognition. The problem, which has appeared after introducing multiple-choice tests, is drilling students on remembering the right answers, but not on thinking about the context.

It is a proved fact that there exist such "trainings" of memory strategies in secondary and higher schools.

In the 1920s the effect of memory set was described in Russia. This effect depends on the requirements of the subsequent testing of remembered information. One of these requirements is the method of testing. L.S. Vygotsky wrote that learning goes in different ways depending on the assessment types: full answer or the identification of information. This problem has been investigated by Russian psychologists A. Smirnov and P. Zinchenko. It has been shown that, firstly, the deliberate memory set prevents from understanding the material, and secondly, the set of the metacognitive strategies of understanding (working with the text, which opens the main ideas in the material, logical connections), on the contrary, mobilizes the resources of incidental memory (Zinchenko, 1961). This effect is known as depth processing effect. F. Craik, B. Chellis, B. Velichkovsky and D. Halpern have proved that metacognitive strategies in encoding information provide the best results in the multiple-choice tests (Velichkovsky, 2006)

For American and European pedagogical system methods like multiple-choice tests are traditional and they have been used for a long time. For example, R. Sternberg, who is interested in different ways of teaching and assessment and style profile, shows that multiple-choice tests can benefit children with such style of thinking and learning as the executive and the conservative ones (Sternberg, 1994). The students with such style try to follow directions, do what they are told, learn assigned information. R. Sternberg analyzed the types of instructional and assessment activities a person prefers and discovered that executive style is connected with such method of instruction as memorization. Thus, we can suppose that the newly established testing practice in Russia provokes an executive style and superficial approach to learning. Aiming at amassing and reproducing knowledge brings about the following results: students working with a text can only see its content as a number of data to memorize without even setting to comprehend and analyze the material in general. Metacognitive reading comprehension strategies, typical for a "deeper" approach, are rarely used.

We have studied the comprehension strategies by students and senior pupils, using the structure of the learning process in the activity paradigm, developed by Ilyasov I. who has examined the problems of mastering the material in detail. He defines activities connected with understanding the material, memorizing and assessment, which ensure the success of the material mastering in different spheres. The structural activity features described by the author, such as the goal, subject and actions, which help to orient, fulfil and control the activity, enable to examine students' strategies (formed spontaneously) and build up a scheme of approximate basis for the formation and correction of activities. Understanding activities, for example, include finding the topic of the information, its systematization that is the determination of logical connections between fragments on

the same topic. The efficiency of these activities is determined to some extent by the students' metacognition — knowledge of logical structure of the explanatory text (Iliasov, 1986).

We have carried out a trial study about what the students of pedagogical department pay attention to in the process of a text comprehension. The examination of the activity aimed at finding the main idea, which most students call the main strategy of working with the text, has been carried out with the use of the methods developed by Malskaya O. and Sidelnikova A. It has shown that only 2% of the students-teachers realize that the main idea is facts and their explanation, which means that they have a standard notion of the structure of an explanatory text. 20% of the students prefer as essential information the sentences in the form of definitions (for instance, "Transplantation is spare-part surgery…"), a historical fact and a statement of the significance of the problem without any facts and explanations (Korotaeva, 2013). The majority of education majors marked out definitions and some facts without explanations. The results show that students do not manage metacognitive knowledge about the characteristics of scientific knowledge and effective strategies for their assimilation.

In our research we evaluated the higher school students' ability to organize the material and to establish meaningful connections between separate fragments.

We have developed a method of individual work with students, which enables to make a quality analysis of how students and senior pupils read explanatory texts, based on the school program material. We have shown some problems with the development of students' and senior pupils' critical thinking and how understanding depends on the use of the strategy of the text systematization. The technique reveals the monitoring of students' understanding and gives an indication of learning approach (Korotaeva, 2000). The technique has been used for many years and has identified a significant change in the quality of metacognitive skills since 90-s (Korotaeva, 2012)

This research is aimed at examining some methods of systematization of explanatory texts by the students of pedagogical and psychological departments. We assume that there are differences in how this understanding strategy functions in various situations of the comprehension assessment: in multiple-choice tests and in the process of formulating students' answers.

Procedure

This study looks at how well students majoring in education and psychology use metacognitive strategies and monitor their comprehension working on the content of the text. The specially constructed expository text (300 words) contained descriptions and explanations of two experiments in growing plants (Korotaeva, 2000). The evaluation of students' reading comprehension strategies based on the contradiction between the first experiment and its explanation.

The description of the fact was at the beginning:
"Plants under green overwrap grow very well and those under the red and blue-violet one grow badly".

The explanation of the fact was in the last paragraph:
"The green overwrap lets green light. Green rays reflected from chlorophyll. Green part of spectrum is not used in photosynthesis. The red and the violet parts of spectrum are the most important".

The main predictor of systematization is indicated contradiction (mistake), which would become obvious if students could establish meaningful connections between separate text fragments. Another one — logical right answer, when students change fact or explanation ("Plants under red and blue-violet overwrap grow very well", "Plants under green overwrap grow badly" in the answers about facts or "Green part of spectrum is used in photosynthesis", "Green rates are not reflected from chlorophyll" in the answers about explanation).

Another indicator — reproduced contradiction in the test and self-formulated answer.

We observe how the students monitor their comprehension while reading the text and answering the questions. Time of operation was not limited. The students can reread the text.

The first question in the given list was about possible problems in evaluating their own comprehension. After reading, we asked students to report whether all clear if not to indicate the fragments, which caused the problem of understanding. The aim was to explore student's notes about problem of understanding or error in the text.

Then research consists of two parts. At first, we gave students the multiple-choice test. Then we asked students to describe and explain the fact (plants under different overwraps) in their own words (self-formulated answer).

Participants

176 students participated:

– 88 students of the third year of the full-time bachelors program from Moscow City Pedagogical University;
– 88 students of the third year of the Department of Psychology from Moscow State University.

The students-teachers and the students-psychologists entered University according to the results of the unified state examinations on mathematics, biology, Russian language (EGE) (education majors — without traditional examinations, psychology majors — with examination on biology).

Analyses and results

- Results of the educational majors in the situation of multiple-choice test in the first part and in the situation of the self-formulated answer in the second part.

Two groups of the students with metacognitive strategy of systematization:
1. Indicated the contradiction
2. Logical right answer

The group without the strategy of systematization:
3. Reproduced the contradiction.

Table 1. Results of the educational majors in the situations of multiple-choice test and self-formulated answers

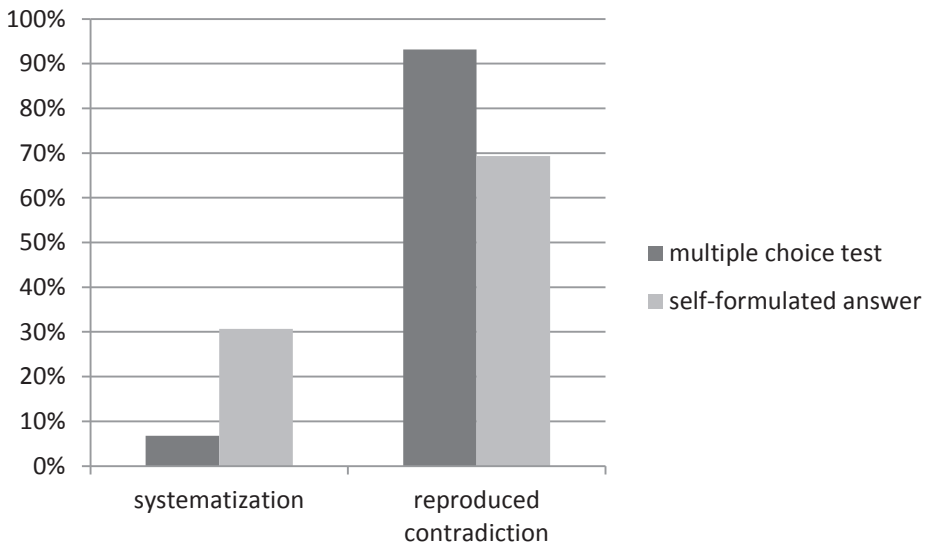|	Systematization, %		Reproduced, %
	Indicated	Logical right	
1 multiple-choice	0%	6,8%	93,2%
2 self-formulated	5,2%	25,5%	69,3%

Figure 1. Results of the educational majors in the situations of multiple-choice test and self-formulated answers

We proposed that the number of education majors with metacognitive strategy of systematization would significantly increase in the situation of self-formulated answer.

Differences turn out to be significant ($\varphi^*=4.291$, $\varphi^*_c=2.31(p\leq 0.01)$).

• Results of psychology majors in the situation of multiple-choice test in the first part and in the situation of the self-formulated answer in the second part.

Two groups of the students with metacognitive strategy of systematization:
1. Indicated the contradiction
2. Logical right answer

The group without the strategy of systematization:
3. Reproduced the contradiction.

Table 2. Results of the psychology majors in the situations of multiple-choice test and self-formulated answers

	Systematization, %		Reproduced, %
	indicated	Logical right	
1 multiple-choice	13,6%	34,1%	52,3%
2 self-formulated	28,1%	45,8%	26,1%
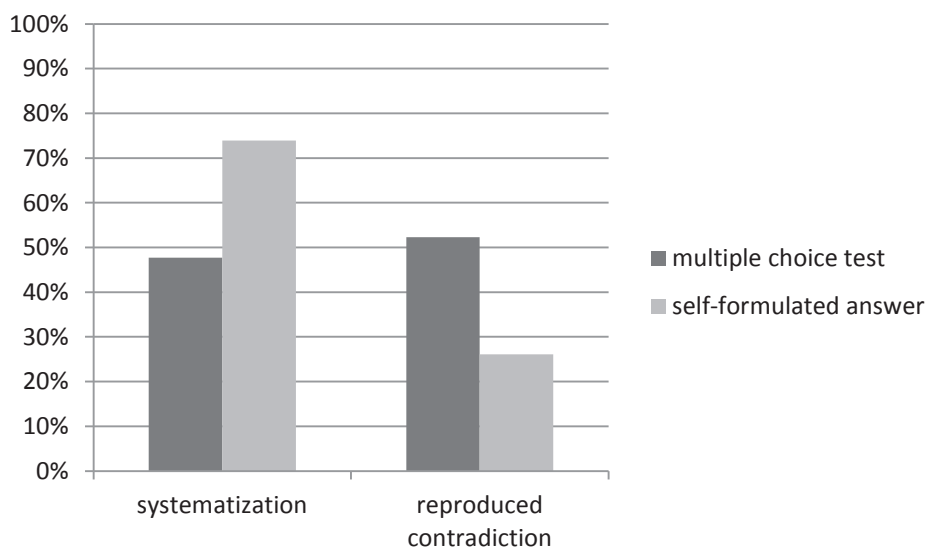
Figure 2. Results of the psychology majors in the situations of multiple-choice test and self-formulated answers

We proposed that the number of psychology majors with metacognitive strategy of systematization would significantly increase in the situation of self-formulated answer.

Differences turn out to be significant (φ^*=3.608, φ^*_c =2.31(p≤ 0.01)).

The results show that only several education majors sought to establish logical connections between the text fragments when they read a text by contrast with 48% of psychology majors. The majority of students of Moscow Pedagogical University use memory strategies. 93% of them reproduced the contradiction in multiple-choice answers. The reports about comprehension problems are absent. Nobody in the group of education majors indicated the contradiction and realized understanding problems by contrast with 14% of psychology students in the situation of multiple-choice test.

Some students majoring in psychology are able to spontaneously use of some strategies for reading comprehension of an educational text (about 50 percent of the group). The study showed that the number of psychology majors with metacognitive strategy of systematization has increased in the situation of self-formulated

answer. The efficiency of comprehension monitoring is low (the main predictor — about 30 percent of the group indicated the contradiction).

The research has pointed out that students did not demonstrate self-regulation process and its potential use in improving their performance rarely generate feedback on their learning.

Conclusion

We can say that the efficiency of work with expository text is very low. Students majoring in education have demonstrated extremely ineffective learning goals and metacognitive strategies. They do not use comprehension monitoring and control of their own cognitive activity. It can be stated that they demonstrate the "superficial" learning approach, which is characterized by the desire to remember the material and recognize right answer. The generalized idea of what it means to learn determines the settings and the choice of the methods to work with educational material.

Sociological study of the unified state examinations showed that the students of Pedagogical Institutes have the worse results (EGE) in Russia (Sobkin V., 2010). The low level of reading culture, the requirements of teachers, professors, assessing student work and assessment methods, the incorrect use of multiple testing in education in humanities adversely affect the professional development of future teachers.

It is important to emphasize the role of different methods of instruction. They influence students' attitudes and strategies. Learning approaches connect with such instructional methods, as memorization, which determines the skill of recognition, and explanation, which requires comprehension strategies. Our results can illustrate the fact that the way pedagogues and psychologists are taught differ: the former are aimed more at reproduction of knowledge, their skills of critical thinking are less well developed than those of the students who are taught by traditional university methods.

The global introduction of testing in education and its substitution for all other types of control of pre-reform Russian school is one of the factors leading to serious pedagogical and psychological problems of training activities. The use of this method in pedagogical practice requires analysis and correction especially while studying humanities.

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