European Journal of Contemporary Education
E-ISSN 2305-6746
2023. 12(4): 1166-1174
DOI: 10.13187/ejced.2023.4.1166
https://ejce.cherkasgu.press

Integrative Technologies as a Means of Forming Metacognitive Competences In High Grade Students

Tatyana Bonkalo [a], Veronika Grebennikova [a], Sergey Belentsov [b, *], Alexander Malkov [a]

[a] Kuban State University, Krasnodar, Russian Federation
[b] Kursk State University, Kursk, Russian Federation

Abstract

The problem of the formation of metacognitive competencies in schoolchildren by means of pedagogical integration (integration of general and additional education, the use of inter- and intra-subject connections in regular and extracurricular activities) is of particular importance in the modern world. The identification of the nature and features of the influence of integrative technologies on the formation of metacognitive competencies among students of specialized senior classes of secondary schools is an urgent problem of modern education.

136 teenagers aged 15-18, students of the senior classes of secondary schools (68 students from classes with the implementation of integrative technologies) made up an experimental group. On the basis of interdisciplinary connections and integration of general and additional education, the subjects “Natural Science”, “Communication”, “Cognition” and “Synergetics” were studied. 68 schoolchildren of the same age (studying in traditional conditions) made up the control group. The pedagogical experiment lasted for two years.

The study was carried out using the author's methodology, the La Costa metacognitive behavior self-assessment scale, the metacognitive knowledge and metacognitive activity self-assessment methodology (M.M. Kashapov and Yu.V. Skvortsova), and the D. Everson. Statistical methods included the calculation of the Student's t-test and the Wilcoxon T-test.

Positive shifts in metacognitive competencies (reflexive ($p < 0.01$), self-organizational ($p < 0.01$) and regulatory ($p < 0.001$), as well as metacognitive behavior ($p < 0.01$) and metacognitive properties ($p < 0.05$) were recorded by the end of the experiment in the main group. Similar changes were not recorded in the control group.

Integrative technologies are an effective means of forming and developing metacognitive competencies in high school students. In this regard, the feasibility of implementing a meta-subject

* Corresponding author
E-mail addresses: si_bel@mail.ru (S.I. Belentsov)

approach and the introduction of integrative lessons and technologies into the educational process of the school has been proven.

Keywords: metacognitive competencies in schoolchildren, integration of general and additional education, youth.

1. Introduction

Competence-based and meta-subject approaches underlie the new Federal State Educational Standards. The developed ability of students to learn and independently acquire new knowledge is recognized as one of the main results of education. This ensures their successful adaptation in rapidly changing living conditions (Shapoval, 2019).

The problem of the formation of metacognitive competencies in high school students by means of pedagogical integration (integration of general and additional education, the use of inter- and intra-subject connections) is of particular importance in the modern world. Integration of general and additional education is an irreversible process of development. It is associated with the reorganization of all types of education. The transition to a new structure in the educational environment and the unification of the educational space are focused on creating conditions for the development of each child's abilities, for the self-realization of children, the disclosure of their talents through new forms of meta-subject and convergent approaches. This definitely improves the quality of the pedagogical process.

This study is aimed at solving the identified problem of the influence of integrative academic subjects on the development of metacognitive competencies among students in high school secondary schools. The purpose of the work is to identify the nature and features of the influence of pedagogical integration.

The metacognitive approach is associated with the name of J. Flavell. It was in his works that the concept of metacognitivism as a new direction in psychological and pedagogical studies of the regulation of the personality's own cognitive processes was introduced for the first time. The question of "thinking about one's own thinking", its nature, mechanisms was raised by the researcher for the first time (Flavell, 1976). In the concept created by the author, metacognitive thinking stands out as an independent type of thinking and includes metacognitive knowledge.

J. Flavell relies on the works of J. Piaget. He differentiates metacognitive thinking as arbitrary, controlled, planned, from formal mental operations. He thereby emphasizes the orientation of metacognitive thinking towards future mental activity for solving specific mental (cognitive) tasks (Flavell, 1976).

Theoretical analysis of foreign studies in the field of metacognitivism, the works of such researchers N. Brick, T. MacIntyre, M. Campbell (Brick et al., 2015), A.L. Brown (Brown, 1987), M.C. Cogliano, M.L. Bernacki and C.M. Kardash (Cogliano et al., 2021) allowed us to identify four main structures in the metacognitive sphere of personality:

- planning of intellectual activity goals, her initiation;
- search and determination of the main means of achieving the goal of intellectual activity, forecasting mental operations;
- programming of intellectual activity to solve the planned tasks and achieve the set goal;
- reflection or control of one's own intellectual activity (Gutierrez de Blume, Montoya, 2021).

The metacognitive direction in Russian pedagogy and psychology is represented by the works of such researchers A.A. Karpov, I.M. Skityaeva (Karpov, Skityaeva, 2005), M.A. Kholodnaya (Kholodnaya, 2002).

The attention is paid to the formation of metacognitive experience as a level component of the intellectual sphere of personality in the concept of M.A. Kholodnaya. This ensures the control of intellectual activity (Kholodnaya, 2002). In metacognitive experience, the scientist distinguishes involuntary and arbitrary intellectual controls, metacognitive awareness and an open cognitive position. According to M.A. Kholodnaya, arbitrary control is carried out at the expense of metacognitive abilities. They are comparable to the metacognitive structures and processes identified in foreign theories of metacognitivistics (Figure 1).

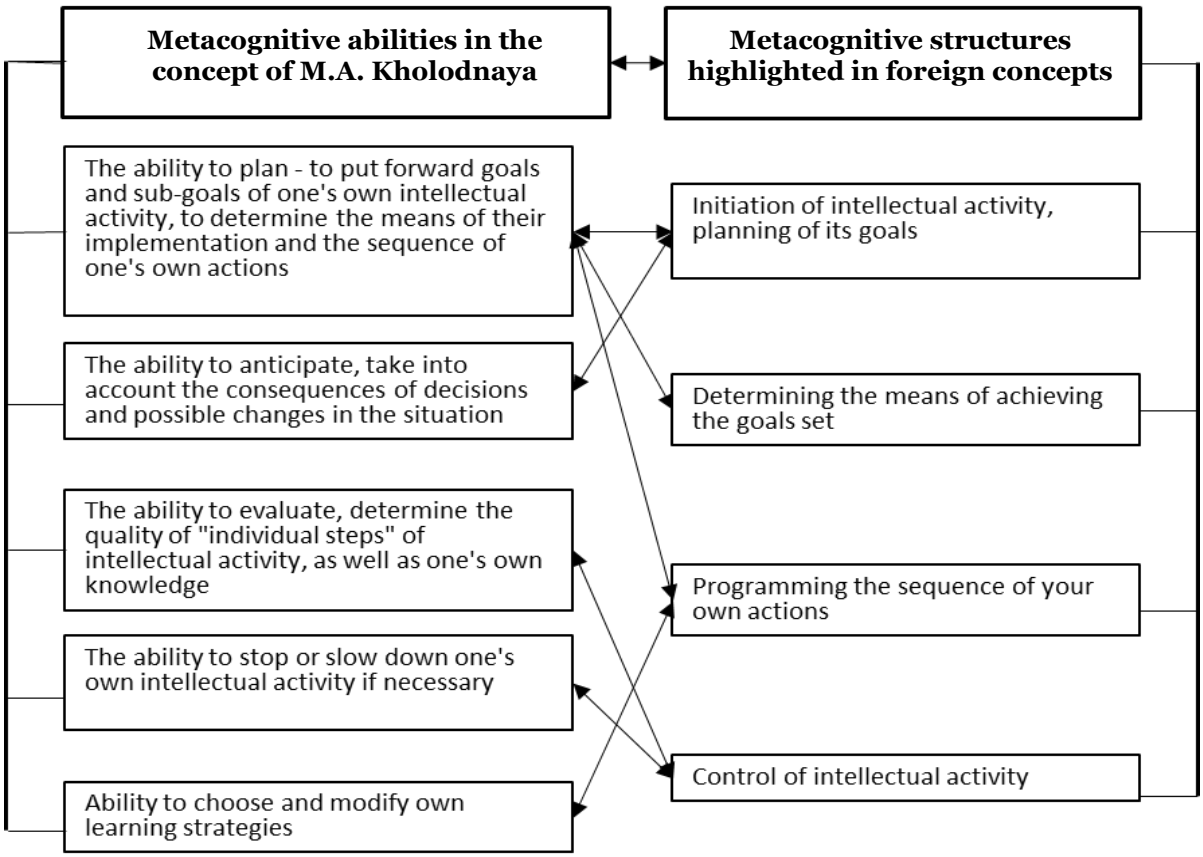

Fig. 1. Comparative analysis of M.A. Kholodnaya's theory and concepts of foreign authors

Metacognitive abilities or metacognitive skills and abilities develop and can be formed at the same time (Chernyavskaya, 2021). These are not static characteristics of the intellectual sphere of the individual. They are subject to changes and influences (Melnikova, 2022).

Theoretical analysis has shown. In modern science, metacognitive processes are interpreted as processes of regulation of cognitive activity (Bodenova, 2020; Byzova et al., 2019; Karpov et al., 2005), a system of knowledge about cognitive activity proper (Perikova, 2021), as processes of metacognitive monitoring (Fomin, 2019), a system for assessing one's ability to think (Efremova, 2013), as a process of controlling one's own thinking (Yushkov, 2022), self-assessment of cognition and cognitive awareness (Yanovskaya, 2013).

The search for an answer to the question (Why is it that a person with talent and developed intellectual abilities will not necessarily be successful in educational activities?) leads researchers to the conclusion that the dominance of cognitive processes over metacognitive processes as the regulation and reflection of mental activity is optional (Shapoval, 2019).

Metacognitive feelings, emotions, experiences (for example, a sense of recall or familiarity) are associated with cognitive processes, especially with the work of memory. Their connection can also be traced with the course of reasoning (feelings of correctness or, on the contrary, error), the solution of difficult mental and creative tasks (a sense of proximity to the solution, solution), research activities (feelings of confidence-uncertainty) and other cognitive processes and phenomena (Tikhonov, 2018).

2. Materials and methods

The formation and development of metacognitive abilities were carried out within the framework of a meta-subject approach. This development has its own history. Metasubject was considered in the writings of Aristotle and other ancient philosophers. But it was only at the end of the XX century that the meta-subject approach began to be developed in connection with the awareness of the disunity of subject knowledge. This involved the integration of knowledge.

136 teenagers aged 15-18, studying in the senior classes of secondary schools took part in the study. Students from classes with the use of integrative technologies (in addition to traditional academic subjects, integrative lessons were present in their basic format) were included in the

experimental group. Such integrative academic subjects as “Cognition” (an integrative subject on the study of the laws of the development of science, methods of scientific cognition, scientific paradigms, patterns and mechanisms of their transformation), “Communication” (an integrative academic subject on the study of the laws of human communication as a process of information exchange), “Natural Science” integrates lessons of chemistry, biology and physics, “Synergetics" studies the connections between elements of different subsystems, the laws of their self-organization and self-development, the patterns of interrelation of elements of open social, physical, chemical systems have been studied.

The second (control) group consisted of 68 high school students of the same age from the system of traditional general education, without the introduction of integrative technologies into it.

Successful academic performance of students of both experimental and control groups and training in specialized classes of natural science orientation served as a criterion for inclusion in research samples.

The pedagogical experiment lasted for two years (grades 10 and 11). At the beginning and at the end of the experiment, pedagogical monitoring was carried out.

The following methods and techniques were diagnostic tools:

- Expert assessment of the student's level of development of the metacognitive competencies identified by the authors (five-point scaling);
- The scale of self-assessment of La Costa's metacognitive behavior in the adaptation of A.V. Karpov (Karpov et al., 2005);
- Methodology of self-assessment of metacognitive knowledge and metacognitive activity by M.M. Kashapov and Yu.V. Skvortsova. It allows us to assess the degree of expression of students' metacognitive knowledge (knowledge about their cognitive abilities) and metacognitive activity as the ability to plan their mental activity and control it (Kashapov et al., 2005);
- Method D. Everson allows you to measure the degree of the propensity to observe your behavior, analyze it, change work tactics if necessary, the degree of the propensity to identify the essence of tasks, carefully consider them, correlate their requirements with existing knowledge; the level of desire for clear planning of the course of solving the problem; the degree of the propensity to recheck your decisions (Perikova, 2022).

The statistical methods of the study included a comparative analysis with the calculation of the Student's t-test and the Wilcoxon T-test. It is used to compare the averages of two groups and determine the randomness of the differences between them. This is any test of a statistical hypothesis. The test statistics correspond to the Student's t-distribution under the null hypothesis. It is most often used in accordance with the normal distribution.

The Wilcoxon T-test is used to compare indicators in two different conditions on the same sample (group) of subjects. It is recommended for samples of moderate size (the number of each sample is from 12 to 40). It allows you to determine not only the direction of changes, but also their severity. We define with its help. Is the shift of indicators in one direction more intense than in the other?

The sample averages have a normal distribution.

3. Discussion and results

A brief theoretical analysis of the main theories and concepts of metacognitive competencies allows us to draw three important conclusions:

- Firstly, the essence, structure and content of metacognitive competencies do not have a clear and traditional understanding. This is due to the lack of development of this problem;
- Secondly, they can be identified only in relation to the activity where metacognitive abilities are manifested;
- Thirdly, metacognitive abilities belong to the “secondary” cognitive processes of comprehending one's subjective participation in mental activity, comprehending the origin of this activity, ways of implementing and managing it, evaluating, controlling and regulating;
- Metacognitive competencies in their structure include metacognitive skills, skills, metacognitive feelings, emotions, experiences and metacognitive personality traits.

The conclusion about the performance of metacognitive competencies of the functions of analysis, control and regulation of students' own mental activity is made on the basis of theoretical analysis.

In this regard, the ability to observe the course of one's thoughts and monitor the effectiveness of using cognitive strategies in solving educational tasks; adequately assess their own

intellectual resources, plan, set goals and allocate their intellectual resources, the ability to apply different methods of obtaining new knowledge depending on the situation and conditions of mental activity, to see and evaluate their mistakes in reasoning and decision-making, choose from a variety of thoughts leading to the success of mental activity, concentrate their attention on the process of their reasoning, analyzing one's own feelings and metacognitive experiences and managing them can be attributed to such competencies.

A special method of expert assessment and self-assessment in accordance with the revealed content of metacognitive competencies, to study the level of their formation in schoolchildren studying in the conditions of traditional and integrative learning has been developed.

The limitations of the study make it possible to clearly limit the possibilities of using the selected research methods, the characteristics of the objects of research, the unambiguity of the context, the boundaries of the subject of the experiment under consideration.

We use the following types of restrictions:

Subject-semantic.We definitely formulate the subject of study. Features, measurements, patterns of development, specific dependencies and other specified, limited parameters of the general object relate to it.

Quantitative. Any subject under study has a numerical manifestation both in the natural sciences and in the humanities;

High-quality. We have established an effective and semantic framework. Outside of them, any knowledge gained loses its scientific significance;

Moral and cultural. Moral principles during the experiment take into account the moral and ideological boundaries of what is permissible in a specific historical situation. The prospects for further research of metacognitive competencies are due to the increasing importance in the modern world of the ability to manage their cognitive activity and educational trajectory for students of all educational stages. More and more requirements are being placed on the competitiveness of a specialist, and, accordingly, the role of professional education of a future specialist is changing. Real practice is moving forward quite quickly, knowledge is becoming obsolete, and more and more emphasis is shifting towards self-study.

Significant differences were not revealed statistically at the beginning of the study between the two research groups. This gave the basis for the objectification of the assessment of the degree of influence of integrative technologies on the development of metacognitive competencies among students in the senior classes of secondary schools.

At the beginning of the experiment, most of the students were characterized by low, below average or average levels of development of the metacognitive competencies we identified: reflexive, as the ability to adequately assess the process and result of their mental activity, self-organizing, as the ability to control the course of their own thoughts and organize mental activity, and regulatory, as the ability to regulate their metacognitive feelings and experiences when solving educational tasks (Table 1).

At the end of the experiment (after two years), firstly, positive changes occurred in all indicators in the experimental group (according to the Wilcoxon T-test, $p < 0.01$-0.001), and secondly, statistically significant differences between the groups were recorded (Table 2).

Table 1. Initial level of formation of metacognitive competencies in students of experimental and control groups (results of expert evaluation)

Metacognitive competencies	EG	KG	t	p
The ability to observe the course of one's thoughts and monitor the effectiveness of using cognitive strategies in solving educational tasks	2,1±0,2	2,2±0,3	0,23	>0,05
The ability to adequately assess their own intellectual resources	2,9±0,3	3,0±0,3	0,18	>0,05
Ability to plan, set goals and allocate your intellectual resources	2,5±0,2	2,4±0,3	0,23	>0,05
The ability to apply different methods of obtaining new knowledge, depending on the situation and conditions of mental activity	2,0±0,2	2,2±0,3	0,45	>0,05

The ability to see and evaluate their mistakes in reasoning and decision-making	2,4±0,3	2,4±0,3	0,00	>0,05
The ability to choose from a variety of your thoughts the one that can lead to success in mental activity	2,0±0,2	2,2±0,2	0,71	>0,05
The ability to concentrate your attention on the process of your reasoning	2,6±0,3	2,5±0,3	0,18	>0,05
Ability to analyze and manage your own feelings and metacognitive experiences	2,3±0,2	2,2±0,2	0,36	>0,05

Source: compiled by the authors

Table 2. Levels of development of metacognitive competencies in students of experimental (EG) and control (KG) groups after the experiment

Metacognitive competencies	EG	KG	t	p
Reflexive metacognitive competencies	3,8±0,4	2,6±0,3	2,40	<0,05
Self-organizational metacognitive competencies	4,6±0,4	3,3±0,3	2,60	<0,05
Regulatory metacognitive competencies	4,4±0,4	2,4±0,2	4,44	<0,001

Source: compiled by the authors

Compared with the beginning of the experiment, the indicators of the frequency of use of metacognitive strategies by schoolchildren of the experimental group have become higher. Statistical processing of experimental data by calculate.group for all studied indicators.

In the control group, over two years of study in the profile class, the indicators of universal metacognitive abilities have the same tendency to increase. However, not all indicators change. This increase is significantly lower in the experimental group (Table 3).

Table 3. Reliability of differences between the control (KG) and experimental (EG) groups in terms of the frequency of use of metacognitive strategies before and after the experiment (La Costa scale)

Indicators	Before the experiment				After the experiment			
	EG	KG	t	p	EG	KG	t	p
Strategic planning	2,4±0,3	2,5±0,3	0,24	>0,05	4,2±0,4	2,8±0,3	2,80	<0,01
Formulation of questions	3,0±0,3	2,9±0,3	0,24	>0,05	4,0±0,3	3,0±0,3	2,38	<0,05
Conscious decision-making	2,8±0,3	2,9±0,4	0,13	>0,05	3,9±0,3	3,2±0,3	1,67	>0,05
Differentiated assessment	3,0±0,4	3,2±0,4	0,36	>0,05	4,2±0,4	3,4±0,4	1,78	>0,05
Assessment of achievements	3,2±0,3	3,0±0,3	0,48	>0,05	4,6±0,5	3,0±0,3	2,79	<0,01
Overcoming subjective limitations	2,4±0,2	2,6±0,3	0,56	>0,05	4,0±0,4	2,9±0,3	2,20	<0,05
Paraphrasing and summarizing	2,9±0,4	2,9±0,3	0,00	>0,05	4,4±0,4	3,1±0,3	2,60	<0,05
The designation of cognitive behavior	2,6±0,3	2,4±0,3	0,24	>0,05	4,2±0,4	2,2±0,3	4,00	<0,001
Definition of terminology	2,2±0,2	2,4±0,2	0,71	>0,05	4,0±0,3	2,8±0,2	3,33	<0,01
Role-playing games	2,9±0,3	2,8±0,3	0,24	>0,05	4,4±0,4	2,8±0,3	3,20	<0,01
Keeping diaries	2,0±0,2	1,9±0,2	0,36	>0,05	4,4±0,4	2,0±0,2	3,11	<0,01
Modeling	2,5±0,3	2,4±0,3	0,24	>0,05	4,5±0,5	2,8±0,3	2,93	<0,01

Source: compiled by the authors

Positive changes in indicators of metacognitive knowledge, metacognitive activity and in such indicators of metacognitive personality traits (the tendency to observe one's thinking, its

productivity, with the help of which strategies are carried out, to highlight the main thing in the task, to separate it from the secondary, the desire to develop a clear plan of mental activity for solving intellectual tasks, to think about each of their actions, recheck the correctness of the conceived strategy and monitor the results of the implementation of the conceived action plan) occurred at the end of the experiment in the experimental group. At the end of the experiment, statistically significant differences between the experimental and control groups were revealed for all indicators of the two diagnostic techniques used (Figures 2, 3).

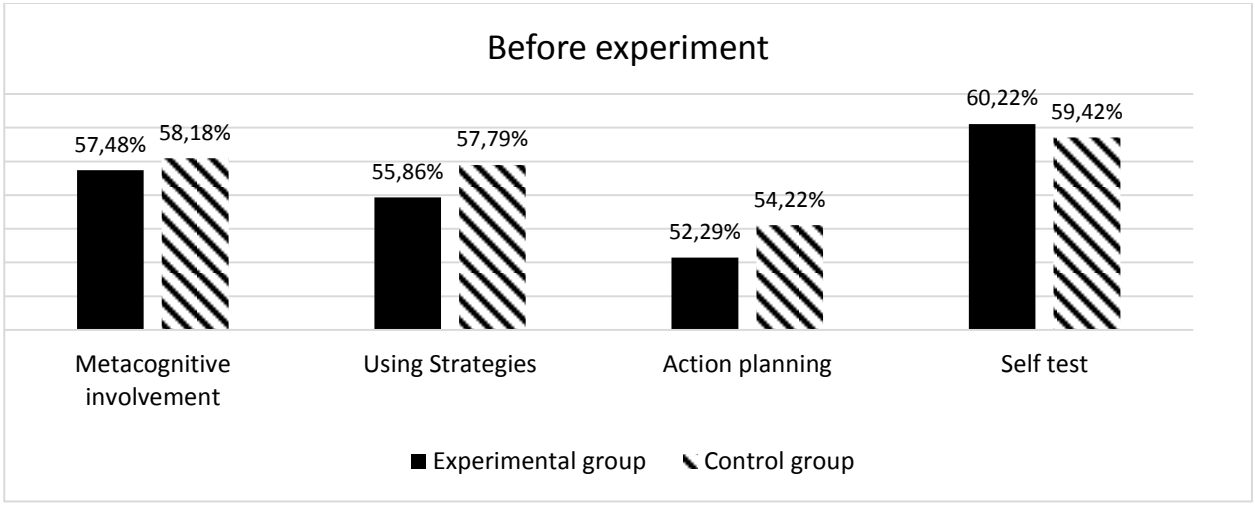

Fig 2. Indicators of metacognitive properties of schoolchildren of experimental and control groups before the experiment
Source: compiled by the authors

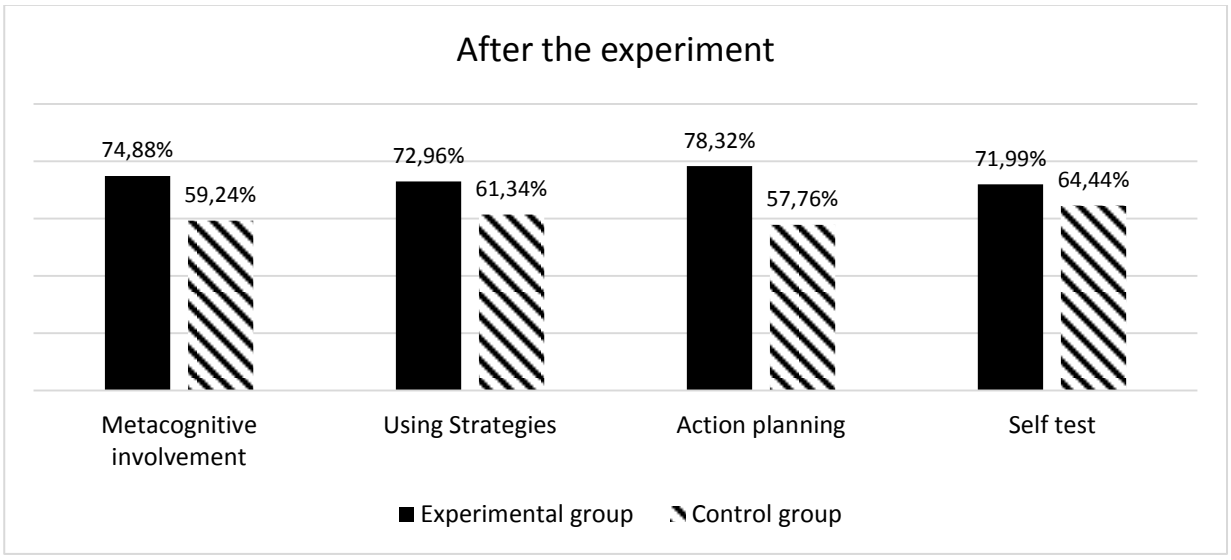

Fig 3. Indicators of metacognitive properties of schoolchildren of the experimental and control groups after the experiment
Source: compiled by the authors

Thus, the indicators of the level of development of metacognitive competencies after the experiment in the experimental group increased.

High school students learned to observe the course of their reasoning when solving integrative learning tasks in the process of participating in the experiment. They assessed various situations of integration of knowledge in the field of different sciences. They saw the essence of her problem, but not only typical and familiar schemes due to metacognitive inclusiveness. Schoolchildren sought to adequately assess their mental actions in solving integrative educational tasks. In the process of integrative learning, the principles of minimizing factual knowledge and

maximizing problem knowledge were implemented. This ensured the predominance of effective training as opposed to informational.

The development of integrative lessons in integrative academic disciplines and integrative learning tasks was based on three levels of integration: the level of intrasubject integration, the level of integration of methods and methods of solving educational problems (for example, comparing the course of reasoning and cognitive strategies used in solving problems of literary analysis and identifying patterns of chemical reaction) and the level of integrative academic subjects taught in within the framework of additional education.

Due to the integration of knowledge, it is not so much the acquisition of new knowledge as the restructuring of existing knowledge that takes place. Such a restructuring involves the appeal of each student to his intellectual and cognitive resources, understanding the laws of his own cognitive action, observing him and controlling him. The very content of integrative knowledge requires the search for new methods, technologies and forms of integrative learning. Here, both heuristic methods and dialogical, interactive, game technologies somehow include elements of metacognitive learning. This involves the use of additional education technologies for retrospective description of the problem solving process, symbolic and schematic vision of problems, reflexive and predictive analysis in integrative lessons. The very essence of pedagogical integration involves the inclusion of technologies for the development of students' metacognitive competencies in the educational process.

4. Conclusion

The conducted research has shown the effectiveness of integrative technologies, the possibility and expediency of their use in order to develop metacognitive competencies in high school students.

5. Acknowledgements

The article was prepared within the framework of the project of the unitary non-profit organization “Kuban Scientific Foundation” IFI-20.1/80 “Preparation of teachers for the development of metacognitive competencies in students based on an integrative approach”.

References

Bodenova, 2020 – *Bodenova, O.V.* (2020) Metakognitivnaya kompetentnost' kak faktor samoregulyacii uchebnoj deyatel'nosti studentov [Metacognitive competence as a factor of self-regulation of students' learning activities]. *Razvitie obrazovaniya*. 2: 13-16. [in Russian]

Brick et al., 2015 – *Brick N., MacIntyre T., Campbell M.* (2015). Metacognitive processes in the self-regulation of performance in elite endurance runners. *Psychology of Sport and Exercise*. 19(1): 9.

Brown, 1987 – *Brown A.L.* (1987). Metacognition, executive control, self-regulation and other more mysterious Mechanisms. *Metacognition, Motivation, and Understanding*. Ch. 3, New Jersey.

Byzova et al., 2019 – *Byzova, V.M., Perikova, E.I., Lovyagina, A.E.* (2019). Metakognitivnaya vklyuchennost' v sisteme psihicheskoj samoregulyacii studentov [Metacognitive involvement in the system of mental self-regulation of students]. *Sibirskij psihologicheskij zhurnal*. 73: 126-140. [in Russian]

Chernyavskaya, 2021 – *Chernyavskaya, V.S.* (2021) Psihologo-pedagogicheskaya programma razvitiya metakognitivnyh sposobnostej shkol'nikov [Psychological and pedagogical program for the development of metacognitive abilities of schoolchildren]. *Vestnik Vladivostokskogo gosudarstvennogo universiteta ekonomiki i servisa*. 3: 218-229. [in Russian]

Cogliano et al., 2021 – *Cogliano, M.C., Bernacki, M.L., Kardash, C.M.* (2021). A metacognitive retrieval practice intervention to improve undergraduates’ monitoring and control processes and use of performance feedback for classroom learning. *Journal of Educational Psychology*. 113(7): 1421-1440.

Efremova, 2013 – *Efremova, T.V.* (2013) Metakognitivnye obrazovatel'nye tekhnologii kak sredstvo formirovaniya i razvitiya universal'nyh uchebnyh dejstvij [Metacognitive educational technologies as a means of formation and development of universal educational actions]. Sankt-Peterburg: VLADOS. 132 p. [in Russian]

Flavell, 1976 – *Flavell, J.H.* (1976). Metacognitive Aspects of Problem Solving. The Nature of Intelligence. Hillsdale. Ed. by L.B. Resnick. N.Y.

Fomin, 2019 – *Fomin, A.E.* (2019). Vliyanie rassuzhdenij o znanii na metakognitivnyj monitoring resheniya proverochnyh zadanij [The influence of reasoning about knowledge on metacognitive monitoring of the solution of test tasks]. *Eksperimental'naya psihologiya*. 12(1): 126-138. [in Russian]

Gutierrez de Blume, Montoya, 2021 – *Gutierrez de Blume A.P., Montoya D.M.* (2021). Differences in Metacognitive Skills Among Undergraduate Students in Education, Psychology, and Medicine. *Revista Colombiana de Psicología*. 30(1): 111-130.

Karpov, Skityaeva, 2005 – *Karpov, A.V., Skityaeva, I.M.* (2005) Psihologiya metakognitivnyh processov lichnosti Psihologiya metakognitivnyh processov lichnosti [Psychology of metacognitive processes of personality]. Moskva, Izdatel'stvo "Institut psihologii Rossijskoj akademii nauk". 352 p. [in Russian]

Kashapov et al., 2005 – *Kashapov, M.M., Skvortsova, Yu.V.* (2005) Razrabotka metodiki samoocenki metakognitivnyh znanij i metakognitivnoj aktivnosti [Development of methods of self-assessment of metacognitive knowledge and metacognitive activity]. *Yaroslavskij psihologicheskij vestnik*. T. 14. Moskva; Yaroslavl': Izd-vo "Rossijskoe psihologicheskoe obshchestvo". Pp. 65-70. [in Russian]

Kholodnaya, 2002 – *Kholodnaya, M.A.* (2002) Psihologiya intellekta: Paradoksy issledovaniya [Psychology of intelligence: Paradoxes of research]. Sankt-Peterburg: Piter. 272 p. [in Russian]

Melnikova, 2022 – *Melnikova, M.L.* (2022) Svyaz' metakognitivnoj vklyuchennosti s individual'nymi intellektual'nymi resursami i razvitiem universal'nyh kompetencij obuchayushchihsya [The connection of metacognitive inclusion with individual intellectual resources and the development of universal competencies of students]. *Vektor nauki Tol'yattinskogo gosudarstvennogo universiteta*. Seriya: Pedagogika, psihologiya. 2: 55-63. [in Russian]

Perikova, 2021 – *Perikova, E.I.* (2021) Sistema psihicheskoj samoregulyacii uchebnoj deyatel'nosti: metakognitivnyj podhod [The system of mental self-regulation of educational activity: a metacognitive approach]. *Sibirskij psihologicheskij zhurnal*. 79: 15-29. [in Russian]

Perikova, 2022 – *Perikova, E.I.* (2022). Faktornaya struktura russkoyazychnoj versii oprosnika "Metakognitivnaya vklyuchennost' v deyatel'nost'" [Factor structure of the Russian-language version of the questionnaire "Metacognitive involvement in activity"]. *Kul'turno-istoricheskaya psihologiya*. 18(2): 116-126. [in Russian]

Shapoval, 2019 – *Shapoval, Yu.R.* (2019). Metapredmetnost' v obrazovanii. Aktual'nost' i perspektivy [Metasubject in education. Relevance and prospects]. *Vestnik nauki i obrazovaniya*. 10: 84-87. [in Russian]

Tikhonov, 2018 – *Tikhonov, R.V.* (2018). Mnogoobrazie metakognitivnyh chuvstv: raznye fenomeny ili raznye terminy? [Diversity of metacognitive feelings: different phenomena or different terms?]. *Vestnik Sankt-Peterburgskogo universiteta*. Psihologiya i pedagogika. 8(3): 214-242. [in Russian]

Yanovskaya, 2013 – *Yanovskaya, N.B.* (2013). Metakognitivnye processy i kognitivnaya deyatel'nost' [Metacognitive processes and cognitive activity]. *Mir psihologii*. 3: 201-207. [in Russian]

Yushkov, 2022 – *Yushkov, N.O.* (2022). Rol' metaznanij v processe obrazovaniya [The role of meta-knowledge in the process of education]. *Molodoj uchenyj*. 17(412): 330-332. [in Russian]