# Development of Cognitive Activity of Students Based on the Technology of Intelligence Cards

Natalia Anatolyevna Savotina[1][a], Maria Valeryevna Reimer[1][b], Galina Vladimirovna Zavada[2][c] and Anastasia Sergeevna Kyvyrzhik[1][d]

[1]*Federal State Budgetary Educational Institution of Higher Education "Kaluga State University named after K.E. Tsiolkovsky", st. Razin str., 26, Kaluga, Russia*

[2]*Federal State Budgetary Educational Institution of Higher Education "Kazan State Energy University", Krasnoselskaya str., 51, Kazan, Tatarstan*

*nasa-amigo@rambler.ru, m.casatkina2011@yandex.ru, g.zavada@mail.ru*

Keywords: Cognitive activity, Smart card technology, Modern school, Competence approach, Competencies, Learning process, Creative abilities of students, Associative thinking, Distance learning, Classical lesson.

Abstract: The article shows that the technology of creating intelligence maps meets the real needs of a modern school, contributes to solving the tasks of a new educational standard for the formation of universal educational actions among schoolchildren, the development of cognitive activity and creative thinking. The essence of intelligence maps is revealed, the features of the use of this technology in secondary school are analyzed, and its effectiveness in history lessons is also proved. The key theoretical characteristics of the technology and the concept of intelligence cards are presented; the analysis of the influence of intelligence cards on the formation of cognitive universal educational actions of students is given; the results of a pedagogical experiment on the formation of cognitive UDS in history lessons by means of intelligence cards are described. The hypothesis is confirmed that the use of the capabilities of intelligence cards in history lessons activates the possibilities of mental activity, promotes the formation of critical thinking skills and increases the overall efficiency of memorizing information by activating the creative abilities of students. Among the proven advantages of intelligence maps, the use of the entire spectrum of brain activity (operating with words, images and numbers, logic, rhythm, color and spatial orientation, providing freedom of arbitrary application of mental capabilities) and the ability to identify missing information for the formulation of a problematic issue, tracking the relationships and interdependencies of several phenomena or concepts is noted. Among the disadvantages of using intelligence cards are: the need for careful preparation and training for their effective use and overcoming the psychological burden of students in case of misunderstanding of the educational task; insufficient scalability of intelligence cards to reflect complex, multi-stage processes when it is impossible to fit all the information completely on a dedicated piece of paper; the risk of overloading the intelligence card with information in which it is easy to get confused, the probability of generating false associations that lead away from the essence of the problem.

## 1 INTRODUCTION

The life of a modern school is characterized by great changes: traditional forms of education are being reviewed, curricula are being changed, alternative programs and textbooks are being developed and introduced, and new teaching and upbringing technologies are being introduced. Such transformations are natural conditions for introducing a new generation of federal State educational standards into the practice of modern schools. The traditional knowledge approach can no longer cope with the complex of such requirements and is replaced by a competence-based approach, the range

[a] https://orcid.org/0000-0002-7148-0377
[b] https://orcid.org/0000-0001-9574-5782
[c] https://orcid.org/0000-0002-4132-2861
[d] https://orcid.org/0009-0001-1323-1882

of tasks of which expands from including the student himself in educational activities, organizing the process of independent mastering of new knowledge by children to applying the acquired knowledge in solving not only cognitive, educational, and practical, but also personal problems. Famous Russian philosopher and teacher 1st half of the twentieth century S. I. Gessen in his work "Education as a culture of personality" uses a paradoxical statement: "The task of teaching is not to make a person smarter, but to make his mind more cultured, to ennoble him...by instilling in him the method of scientific knowledge. It is a mind that has embraced scientific culture and is able to subordinate the arbitrariness of its thinking to objective requirements... "(Hessen, 2003, p.18). According to the requirements of the Federal State Educational Standard for the results of mastering the basic educational program of basic general education, the subject results of studying are not only mastering basic knowledge and developing the basics of civic self-identification of the individual, but also the formation of search skills among students. analysis, comparison, and evaluation of various information. In this regard, technologies designed to help children develop critical thinking skills are beginning to play a significant role in the learning process. The ability to compare, analyze, and draw conclusions directly related to the processes of thinking is inextricably linked to the development of imagination: like thinking, imagination arises in a problem situation, is motivated by the needs of the individual and is determined by the level of development of consciousness. Emphasizing the interdependence between thinking and imagination, K. D. Ushinsky, the founder of Russian scientific pedagogy, wrote that " a strong, active imagination is a necessary accessory of a great mind" (Sidorov P. I., Parnyakov A.V., 2000, p. 126).

## 2 RESEARCH METHODOLOGY

The main objectives of the research are to study the key theoretical characteristics of the technology and history of intelligent maps; to analyze the influence of intelligent maps on the formation of cognitive functions. universal learning activities of students; description of the results of a pedagogical experiment on the formation of cognitive DMS in history lessons by means of intelligence maps.

An intelligence map (or mental map) is a special visualized diagram in the form of a tree diagram, which is used to organize and record information in the form and with those associations, concepts, drawings, and words that facilitate the process of memorizing and analyzing information for the student. Unlike linear recording methods, the intelligence map is designed not for a large amount of text or individual sentences, but for the use of color images, keywords, signs, and symbols. The first sketches of intelligence maps are found in the works of ancient philosophers: the earliest graphical representation of complex information was proposed by Porphyry of Tyros (III century AD), which regulated the concept of categories in Aristotle's philosophy. The method of recording new material, in which thoughts, ideas, or facts are arranged around a central concept so that everyone can get a comprehensive view of it, was developed by Tony Buzen in late 60s XX Q. how an effective method of generating ideas through associations. The main provisions of the scientist's concept were first presented in the book "Use Your Head"(1974), ("Work with your head"). This book formed the basis of "The mind map book"(1993) ("Supermind", 2003), written with his brother Barry Buzen. Tony Buzen created his own software to support the creation of "mind maps" called MindMap in December 2006. Today, more than 200 computer programs have been created for creating intelligent maps. The mind map offers the simplest and most effective way to both put information in and extract it from the brain and is linked to an inseparable part of human nature (Buzen T., 2007).

In Russia at the present time Elena Bershadskaya, a professor at St. Petersburg State University, is engaged in intelligent map technologies. Alexandrovna. Theoretical issues of this technology are covered on the website Mikhail Yevgenyevich Bershadsky (Bershadsky M. E., 2021).

Scientists agree that intellect maps are hierarchical and show relationships between elements of the same topic: they are organized and consistent. Creating smart maps starts with an image of the main concept in the middle of a blank page, and then additional branches are added to this central concept, which also contain keywords, concepts, and associations.

A characteristic feature of the imagination is its reliance on personal images, concrete representations, images, and associations, the ability of the human brain to remember which is much higher than to assimilate concepts (Vorobyova V. M., Budunova L. G., 2013). That is why the modern teacher in his work is called upon to ensure the development of students ' creative abilities and actively involve their resources in the educational

process, so that the assimilation of new knowledge becomes much more effective and exciting for most children. One of these technologies that contributes to to stimulate the creative process, develop the skills of planning, annotating, and analyzing the technology of intelligent maps is currently considered an indispensable tool for conscious taking notes. She allows you to quickly and easily visually organize or plan educational activities, make notes, memorize, and organize voluminous information. Smart Card Technology - it is a technology for displaying information in a graphical form; a tool that allows you to effectively structure information and think using your full creative potential.

The use of accents in the process of creating an intelligence map contributes to more effective memorization of information. In the course of work, it is advisable to give the branches natural curves to make them visually more attractive, and try to make them unique in size, color, volume, and execution for better memorization of information. For example, students can make the main branches thicker or represent them in the form of a subject that is related to the topic being studied, as well as graphically highlight the most important words using fonts, colors and text size (Markov S., 2019).

The use of different colors in the process of creating intelligence maps makes them much more interesting to view, and, therefore, to remember. For high school students, working with color is an element of psychological relief, making the learning process pleasant and exciting, and also encourages mental activity, because the right hemisphere of the brain is usually responsible for the perception of various colors.

Small drawings, symbols, icons, and doodles stimulate associative thinking, help to visualize the topic and keep it in memory for a longer period of time, and therefore are an integral part of intelligence maps. However, if students decide to make their work more colorful, they should avoid being too picturesque, as they may miss out on important content in their pursuit of aesthetics.

Visual symbols – icons-add clarity to contextual meaning and are recognized much faster by the brain than regular text. As such, you can use ticks, crosses, circles, triangles, or more detailed and descriptive symbols. (Figure 1).

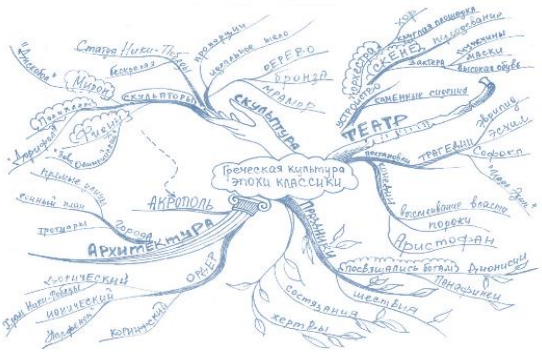


Figure 1: Features of intelligence.

One of the characteristic features of intelligence cards is that information located on one sheet in a form that is sufficient for understanding and acceptable for memorizing is much better absorbed. Experiments conducted by scientists in the framework of studying the possibilities and effectiveness of using intelligence maps showed that when using this form of work, even students who did not do well in the program felt involved in the topic being studied since they had a complete picture of events before their eyes, supported by their own associations (Dhiyauddin A., 2018).

In addition, intelligence cards force students to plan their thought process on paper, thereby contributing to the development of their practical skills. They can be created using special graphic editors, as well as using pens, colored pencils, or markers on a regular piece of paper. Of course, in the context of a classical lesson, in our experiment, a history lesson, we have only the resources of student notebooks, which does not affect the effectiveness of using this technology. In the context of distance learning and as a homework assignment, children can be offered a task on drawing up intelligence maps using one of the popular services:"Mindmeister», «Mindomo"or "Mind42» (Samokhina V. M., 2016).

# 3 RESEARCH RESULTS

Purpose of the work - to show the effectiveness of using the technology of intelligence maps for activating cognitive activity, developing creative abilities, and forming cognitive universal educational actions of students in history lessons. The essence of our experiment was to use the example of one of the topics studied in history lessons in accordance with the educational program in the fifth grade, to consider the quality of the final assimilation of knowledge of

students in these classes in two cases: when children are individually engaged in drawing up an intelligence map in notebooks during the introduction lesson, using information that given by the teacher and textbook materials; and provided that a traditional synopsis of a new topic is written.

The results of tests conducted as part of the homework review were used as a method for evaluating the effectiveness of knowledge acquisition in both cases. In order to compare the results not only between classes, but also within one of them, in the lesson in which the intelligence card technology was used, we also took the results for the previous test work.

So, before the experiment, we had the following indicators of the recently completed test work in the" A "class: out of 25 people, only 6 students received a mark of "5" - this is 24%, 9 – "4" (36%), 5 – "3" (20%), and the remaining 5 at all failed to complete the task (20%). As a result, the overall success rate of the 5 "A" class of the test work was 80%.

The same test paper in the" B " class showed the following results: 8 out of 27 students earned a mark "5" (30%), 12 – "4" (44%), 4 – "3" (15%) and failed to complete the test tasks – 3 (11%). So, the total academic performance of the 5th "B" class was 89% (Figure 2).

As the subject of the experimental lesson, we chose "Greek culture of the classical era", which corresponds to one of the paragraphs of the textbook on the history of the ancient world edited by V. I. Abramovich. Prickly (Ukolova V. I., 2019). This lesson was designed for independent work of 5th grade students with the text of the textbook, which was preceded by a five-minute explanation of the teacher, which included: announcement of the topic new material, general familiarization with its content, focusing students ' attention on the issues that they need to learn, as well as detailed advice on how to work independently.

At the beginning of lesson 5 "A", the class was asked to create an intelligence map using pre-prepared pens and colored pencils, and 5 " B " worked in the usual format. A total of 40 minutes were spent studying the topic at school in both cases. Seventeen students from the 5th "A" class managed to complete their work during this time, five students reworked 3 of the 4 blocks of information presented, and four managed to add only two sections to the map. Thus, 36% of students continued to create an intelligence map at home. Students of 5 "B", working together with the teacher, managed to take notes on the materials of three sections.

At the next lesson, as a test of the quality of mastering the topic "Greek Culture of the Classical era", the children of both classes were offered a test paper on the topic they had studied.

Its results in the 5th "A" grade were as follows: 8 students coped with the work on "5", which is 32%, 11-on "4" (44%), 4 – on " 3 "(16%), and 2 – did not cope with the work and received a mark of " 2"(8%). So, the overall success rate for completing test tasks in this class was 92%.

Students of the 5th "B" class coped with the test work as follows: 9 students received a mark "5" (33%), 10 – "4" (37%), 5 – "3" (19%), ah 3 – "2" (11%). Speaking about the overall performance of the class, we note that 89 students successfully completed the tasks (Figure 3).

Summing up, we can note that the qualitative success rate of mastering the material in the 5th "A" class increased by 12%, while the percentage ratio in the 5th "B" class did not change (Figure 4). The number of students and their personnel did not change during the entire duration of the experiment.

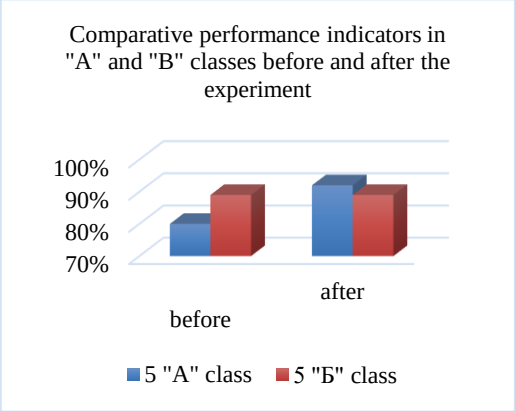


Figure 2: Comparative performance indicators in "A" and "B" classes before and after the experiment.

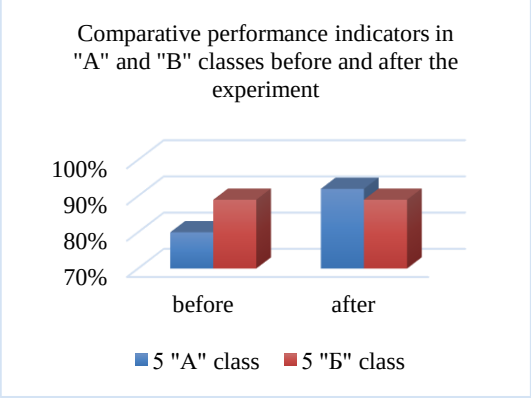


Figure 3: Comparative performance indicators in "A" and "B" classes before and after the experiment.

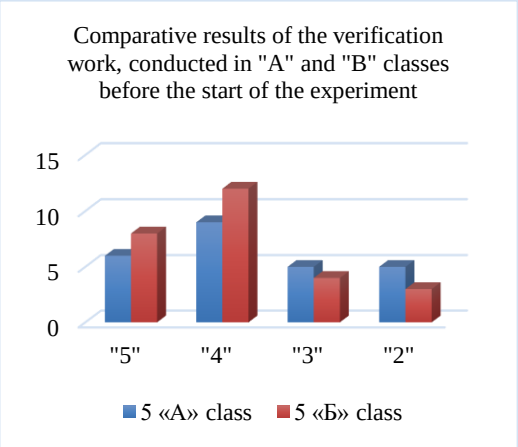


Figure 4: Comparative results of the verification work, conducted in "A" and "B" classes before the start of the experiment.

## 4 DISCUSSION

The conducted experiment gives us the right to speak about the success of using the technology of creating intelligence maps in history lessons to increase the efficiency of learning new material. Among the confirmed advantages: it should be noted that the maps reflect the natural radian way of thinking of the human brain, which is the basis of their effectiveness, and the use of the entire spectrum of brain activity — operating with words, images and numbers, logic, rhythm, color and spatial orientation-provides the freedom to freely apply the unlimited possibilities inherent in the brain of each person.

We have found that intelligence maps are also useful if students are faced with the task of finding information that will be relevant to the problem statement, considering the interdependence and interrelationships of phenomena or concepts.

## 5 CONCLUSIONS

This method stimulates cognitive activity of students, develops creative and critical thinking, helps students to perceive and remember the necessary information more easily, improves memory, intelligence, and acceleration of the thought process by activating the hidden capabilities of the mind. Among the disadvantages of using intelligence cards, it is necessary to indicate the need for careful preparation and training for their effective use, since when creating the first intelligence cards, students may experience a large psychological load and not fully understand what is required of them.

It is also worth noting the insufficient scale of the use of intelligence maps for stating complex and multifunctional processes, when it is difficult to place all the complete information on a certain section of paper. However, if the required space is available, there is a risk that the smart card will be overloaded with information that is easy to get confused, and therefore difficult to understand and remember.

And, finally, the peculiarity of associations is their individuality and subjectivity – they often depend on internal and external changing conditions, and as a result, there is a possibility of generating false associations that lead away from the essence of the problem. For these reasons, it is necessary for the teacher to carefully think out tasks for students in the lesson using intelligence cards, an algorithm for their sequence, and considering individual thinking characteristics.

Thus, considering the advantages and disadvantages the technology of creating and using intelligent maps meets the modern needs of the school, contributes to the implementation of the tasks set by the new educational standard for the formation of universal educational actions among schoolchildren and the development of cognitive activity.

## REFERENCES

Diyauddin, A., Ahmad, S., Ismail M., 2018. A mental cartographic approach to the study of history. *International Journal of Engineering and Technology*, 7 (3.15), 59-62.

Bershadsky, M. E., 2021. The method of intelligence maps. Extracted from: http://bershadskiy.ru/.

Buzen, T., 2007. Memory Cards: Use your memory 100%. Moscow, Rosman.

Vorobyova, V. M., Budunova, L. G., 2013. Effective use of the method of intelligence maps in the classroom: A methodological guide. Moscow, GBOU "Temotsentr".

Hessen, S. I., 2009. Education as a culture of personality is extracted from: http://kniga.lib-i.ru/26psihologiya/530011-1-uchebno-poznavatelnie-kompetencii-zadacha-obucheniya-zaklyuchaetsya-tom-chtobi-sdelat-cheloveka-umnee-tom-chtob.php.

Markov, S., 2019. Mind mapping (Intelligence maps) as a method of analyzing complex situations and creative problem solving. Extracted from: https://geniusrevive.com/majnd-mepping-intellekt-karty-sushhnost-pravila-i-etapy/.

Samokhina, V. M., 2016. The use of intelligence cards in training. *Young Scientist*, 29 (133), 598-600.

Sidorov, P. I., Parnyakov, A.V., 2000. Introduction to Clinical Psychology. T. I. Textbook for medical university students. Yekaterinburg, Business book.

Ukolova, V. I., 2019. Universal history. Ancient world. 5th grade: textbook for general education organizations. Moscow, Enlightenment.

Savotina, N.A., Khachikyan, E.I., Bondarenko, V., Ilyukhina, A., 2020. Digital technologies in modern education: risks and resources. *Physical journal: A series of conferences*, Volume 1691, Issue 1.