

# Mental Map Compilation Technology as Means of Knowledge Visualization in Electronic Environment



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**Abstract:** *Training of modern students of higher educational institutions is subordinated to the main purpose-formation of their professional competence. In terms of competence-based approach, higher schools seek to implement training methods that provide ample opportunities for the development of a competitive specialist capable of systematic, independent activity. In this regard, teachers introduce mental maps into educational process that contributes to logical alignment of the student's activities. The purpose of the article is to consider the technology of drawing up a mental map in the study of pedagogical courses by students. The authors reveal the functions of mental maps and the stages of their development in electronic environment. The presented study allows us to draw conclusions about the need for the use of mental maps in the training of students. Students who took part in the development of mental maps master courses more quickly, while the quality of its reproduction increases which contributes to better preparation for professional activities. In the course of the study, we have identified broad possibilities of mental maps which are a promising direction in learning. The positive results of the experiment indicate the need for further implementation of maps in the training of higher educational institutions students.*

**Keywords:** *higher school, mental maps, pedagogical courses, technologies.*

## I. INTRODUCTION

The question of development of students' professional competence is one of the most important in modern higher education. Modern student's training should be practice-focused, aimed at the development of independence and creative components, and at the same time this process should be systematic and logical in order that students could track down their mistakes and carry out appropriate corrective activities. In the conditions of increasing amounts of involvement, increasing the pace of learning, it becomes difficult for students to perceive teaching content, so teachers are looking for ways that would help the student to assimilate theoretical knowledge.

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In addition, Federal state educational standards also impose duties on teachers, the purpose of which is to develop students' competence. To fulfill these requirements, students must quickly assimilate their involvement and implement theoretical knowledge in practice. Since there is a lot of involvement, as we have already said, visualization becomes especially important, that is, the image of various educational tools in the form of graphs, diagrams, tables or maps. In this article we pay attention to mental maps in electronic environment, which are a means of systematizing basic tool allowing students not only to learn faster, but also to build their own activities more quickly. The more effective the student's activity is, the higher the level of his competence development is.

## II. LITERATURE REVIEW

### A. The Concept of mental maps

The mental map in electronic environment is a method of systematization allowing students to remember as much material as possible, which he will be able to reproduce in the future and apply in practice [1]. In the modern training of specialists, the use of mental maps in electronic environment begins to develop actively, since this method gives higher results in the training of students [2]. Mental maps are defined both as a way to systematize knowledge and as a graphic representation [3]. Human thinking is built in such a way that it perceives maps better than charts or tables. Mental maps and complementing them contribute to a better understanding of the content presented [4]. The essence of mental maps is the visual representation of the material which students remember much more successfully [5]. Mental cards effectively develop students' thinking, allow them to solve tasks creatively [6]. In the process of training, teachers present them as visual spatial models, in which one can clearly trace the relationship of elements [7]. Metal cards most often have a tree-like form, which depicts words, tasks, ideas which are connected with each other by "branches" [8]. The central concept is the key point and from it diverge the lines on which students write or draw images.

### B. The possibilities of mental cards

Mental maps in electronic environment allow developing systematic thinking of the student [9]. In the process of using mental maps, the student connects only relevant solutions of the task, on the basis of which he forms his own opinion and thus looks at the problem in a new way, from a different angle,

which leads to non-standard solutions. Mental maps, when developing educational projects, allow us to consider all possible options for building the process, take into account all the nuances, choose the necessary tools to obtain a high result [10].

In the research activities of students, mental maps serve as a tool for finding contradictions, identifying possible problems [11]. Among the main advantages of mental maps the identification of major errors at the stage of development of the question can be noted, since all available data are presented visually [12].

Among the important properties of mental cards in electronic environment are the following: memorability, aesthetic appeal, stimulation of creativity [13].

The use of mental maps in educational process in electronic environment allows the development of structural thinking thanks to which students build their own activities in a consistent and logical manner, which, in turn, contributes to the development of independence and responsibility for the results of their own activities. Mental maps in electronic environment allow you to timely identify and correct errors, carry out reflection. It is much more difficult for a student to perceive traditional classical notes than key positions highlighted in color with correctly placed accents. The necessary elements appear in the memory, relying on which the student builds his answer.

### C. Visualization using mental maps

The basis of mental maps technology is the principles of perception by the brain [14]. This includes associative thinking, visualization of images and integrity of perception [15]. The role of visualization is quite large [16]. Visualization is an important component of the learning process [17]. A. A. Verbitsky in his works defined visualization as a process, the essence of which was to build the results of mental operations in a visual image. Visualization was also considered By M. Minsky, F. Bartlett, who presented this phenomenon as a thought process transferred from the internal state of man to the external [18]. The importance of visual models in electronic environment increases, as they allow eliminating difficulties with the perception and to build the process in a logical sequence [19]. One of the main types of visualization is considered cognitive visualization, the elements of which include drawings, diagrams, graphs [20]. It is based on the principle that the effectiveness of the study becomes higher if the visibility is not only illustrative, but also cognitive function.

### D. Functions of mental maps in the study of students of professional courses in higher education in electronic environment

The study of professional courses is the main part of the preparation of a highly qualified specialist. Therefore, the development of the competence of future graduates depends on the level of their development. Mental maps in the study of professional courses in electronic environment allow you to quickly and efficiently master the basics of professional activity. The functionality of mental cards in the development of professional courses is as follows:

- effective distribution of time and the construction of the

stages of the task;

- effective search for non-standard methods for solving the problem;
- collective solution to the question;
- generalization and systematization of theoretical material;
- preparation for test activities.

The functionality of mental maps is based on the principles of accessibility and sufficiency.

### E. Modern educational technologies in the implementation of mental maps

In the modern educational process, a large number of educational technologies are implemented that contribute to the development of students' competence. The use of technologies leads to the achievement of guaranteed results, so they are very popular in higher education institutions. Educational technologies are also used in the use of mental maps. To build a mental map in electronic environment, students can join groups. Technologies of group training contribute to the development of operational solutions and teach interaction to achieve high results. Modern mental maps are developed using electronic technologies. Interactive whiteboards and multimedia projectors can be used in the classroom to introduce each particular map to all students. If necessary, these cards can be sent by mail. In the process of drawing up a mental map, discussions unfold, through which students build different hypotheses.

## III. METHODOLOGY

Our study involved students studying the course "Vocational training (by industry)" in the number of 48 people (2 groups of students of 24 people each). We analyzed the results of training students before the introduction of mental maps in the learning process (1 group of students) and after the introduction (2 group).

We also conducted a survey among students of the second group (24 people) on the topic "Would you like to use mental maps in the educational process?" "No."

The results showed that before the introduction of mental cards, students were little aware of their purpose and functional properties, so the percentage of those wishing to use them was not high enough (55%). After their implementation, students realized their importance in the development of their own professional competence. After the survey, the percentage of answers "yes" increased to 80%.

## IV. RESULT AND DISCUSSION

We had conducted a study in which took part two groups of students on the 24 men, studying at the direction of training "Vocational training (on branches)". In the first group, training took place without the use of mental maps. The second group actively used them in the process of performing various tasks in electronic environment. Students, with the consultant role of the teacher, independently compiled the map data in electronic environment. To carry out mental maps in the study of such courses as "Pedagogical technologies", "General and professional pedagogy",

“Introduction to the specialty” it is necessary to adhere to a certain technology, which leads to the achievement of positive results.

Mental maps are used for such purposes as:

- note taking, structuring of educational involvement;
- the method by which a student remembers a large amount of involvement in preparation for practical exercises, seminars, control events;
- preparation for participating in discussions (“brainstorming”). Students select relevant tools, analyze the opinions of various researchers in order to develop their opinions;
- when planning activities to resolve problem situations posed by a teacher that may arise in a real professional activity, a future graduate may need an operational solution. The mental map forms the skill of quick and timely decision making.

The technology of drawing cards is changed in dependence on the assigned tasks. To compile a mental map, a student goes through several stages.

At the first stage, students are united in subgroups. In the process of interaction, the development of a solution becomes much more effective. Absolutely all ideas that come to students’ mind are written on a piece of paper. Such ideas may be absurd, but they are not criticized. In such circumstances, students learn not to be afraid to express their own opinions. When discussing the topic, students find some of the most likely hypotheses. At the second stage, students draw a mental map. The main concept is placed in the center of the sheet and branches are drawn from it with secondary words characterizing the first concept. Students select these words from those options that were chosen after the brainstorming. At the third stage, for each word, its own color or image is determined, which is best suited for remembering. So, students give the card emotional expressiveness, the response to which is much higher than the simple text. At the fourth stage, each student adjusts the map for himself, adding the necessary elements that he understands for memorization.

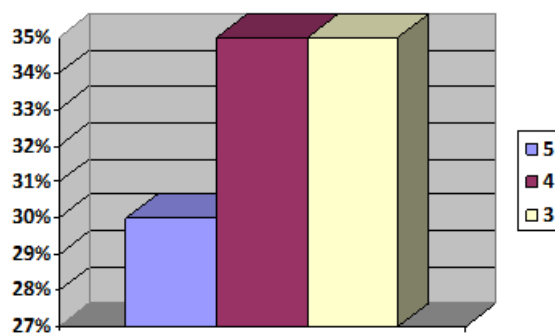
When developing a mental map in the lesson and as an independent work, the student can choose the software tool for implementing the map himself. Here he is guided by his own preferences. Such services as MindMeis - ter , Mindomo, Bubbl can be used. These services help students jointly develop maps at a distance from each other.

During the control event, the teacher sets grades. Table 1 shows the characteristics of the grades.

**Table- I: Student Grade**

Rating	Characteristic
5	The student perfectly remembers the content, reproduces the material correctly and in sufficient detail and applies the acquired knowledge in practice
4	The student remembers enough content, reproduces it, omitting some details, knows how to put into practice the material studied
3	The student weakly remembers content, partially reproduces the learned material, does not seek to put into practice theoretical knowledge

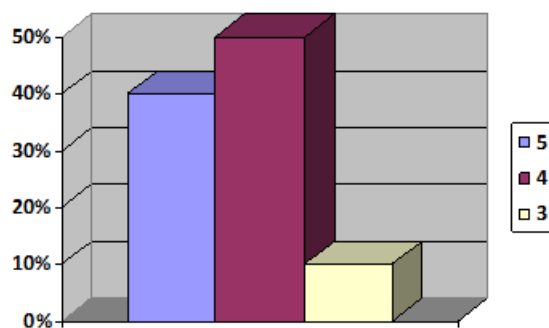
Figure 1 shows the results of the evaluation of the first group of students who studied without the use of mental maps.



**Fig. 1.Evaluation results of group 1.**

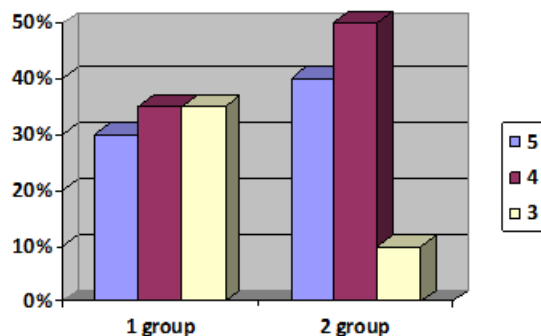
In the first group, the results were not high enough. The percentage of students who received positive and negative marks is approximately the same.

Among the students of the second group we conducted a survey on the topic “Would you Like to use mental maps in the educational process?”The results are presented in figure 4.



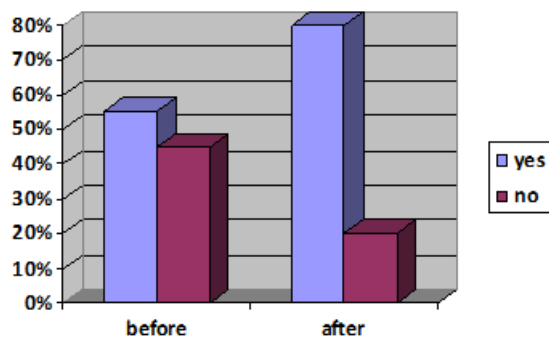
**Fig. 2.Assessment results of 2 groups.**

Thanks to the introduction of mental maps in the preparation of students, we were able to improve performance, increase the percentage of students with positive grades and significantly reduce the percentage of students with low results. Students began to learn much more content in a short period of time. Thus they not only remember involvement, but also qualitatively, in detail reproduce it.



**Fig. 3.Results of evaluation of two groups**

We can see that the results of the second group are much better than in the first. From which we conclude that mental maps are a productive tool in the study of professional courses.



**Fig. 4. Survey of students of the second group**

A survey of students showed that before the introduction of mental maps, 55% of respondents showed interest in them. This suggests that students were not fully aware of the nature and role of mental maps and interest was often based on a desire to use something new in learning. After the introduction of these cards, students realized their advantages and expressed the opinion that they would like to use them in further education.

## V. RESULT AND DISCUSSION

The results showed that before the introduction of mental cards in electronic environment, students were little aware of their purpose and functional properties, so the percentage of those wishing to use them was not high enough (55%). After their implementation, students realized their importance in the development of their own professional competence. Cards in electronic environment help to develop creative thinking, work independently and develop non-standard solutions to problems. When assessing the work done by students, teachers relied on the ability of students to work with content, remember it, reproduce it and apply it in practice. In the first group, the results were not high enough. The percentage of students who received positive and negative marks is approximately the same. Score "5" in 30% of students, "4" - in 35% and "3" - in 35%. Thanks to the introduction of mental maps in the preparation of students in electronic environment, we were able to improve performance, increase the percentage of students with positive grades and significantly reduce the percentage of students with low results. 40% of students in the second group received a grade of "5", 50% received a grade of "4", and only 10% - "3".

## VI. CONCLUSION

In the course of our work, we achieved our goal. We have considered the technology of drawing up a mental map in the study of pedagogical courses by students in electronic environment. It was found that mental maps in the process of professional training of students are presented in the form of diagrams, drawings and models that represent the relationship of certain objects. Research has shown that the use of mental cards improves the preparation of students. With their help, they remember much more relevant content, become more independent and creative. The survey conducted among the respondents of the second group showed that students were initially interested in using mental maps, but their interest in

most cases was based on the need for the use of something new. After the introduction of the cards, the students realized their essence and expressed the opinion that they would like to use them further. Consequently, the importance of mental maps is quite large and the use of their capabilities is necessary in the highly qualified competent specialists training.

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