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Learning technology with using of cognitive graphics cards

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Abstract

The article deals with the need of improvement of the system of training engineering teachers of computer disciplines on the base of scientifically based didactic innovative technologies. This article also analyzes the existing learning technologies and pedagogical aspects of technology of construction and use of cognitive maps in educational activities. Actuality of their application and mapping software capabilities is proved, the model of cognitive maps is investigated.

Key words: technology, cognitive visualization, cognitive map, computer disciplines engineering teachers.

Introduction

In the current environment of global world informatization, the creation and transmission of information in a more concise and more favorable perception form becomes more urgent. Communication processes in society, starting with the turn of the twentieth century, start to have distinct features of visualization. This is reflected in the forms of social interaction and social relationships of people is very important to support the progress of science and education.

Today, education tends to intensify learning. Such tendencies appear in using active learning methods and new technologies, increasing the capacity of informative knowledge and the rate of cognitive activity of students. Traditional methods and forms of education acquire significant changes as those that do not meet the full requirements of the new educational paradigm “learning throughout life”.

Exploring issues of teaching computer science technologies and disciplines on informatization of educational process for future computer disciplines engineering teachers using cognitive visualization techniques, we concluded that the visualization of information by the ICT involves a combination of educational and informational teaching technology. In [Олексів 2010: 68] we defined the nature, composition and use of these technologies as those that optimally organize educational and cognitive activity of students in order to obtain a high level

of professionalism using methods and technical means for collecting, organizing, storing, processing, transmission and presentation of information. It is important to develop the system of knowledge about information technologies and skills to use this knowledge for the organization of the educational process. The feature and undeniable advantage of using above mentioned technology is interactivity, dynamism and multimedia.

The aim of the article is to highlight the didactic principles of cognitive visualization application in the training of computer type engineering teachers by implementing educational technology of teaching computer science and disciplines on informatization of educational process for future computer type engineering teachers using cognitive maps.

Main part

Our study determined the potential effect of using cognitive maps to determine the level of students` mastering of academic material (comprehension of heard and read material; structuring, systematization and correlation of previously acquired knowledge). This study was conducted in response to the need of capturing large amounts of educational information in terms of limited classroom time and imperfect technology of knowledge representation and comprehension using cognitive visualization tools in the preparation of computer engineering teachers.

By analyzing existing learning technologies, we determined that the use of cognitive maps in teaching and learning activity of students is based on these approaches and theories:

- consolidation of teaching assimilation units (P. Erdniyev, B. Erdniyev). Using cognitive maps created with specialized software makes it possible not only to present course material in an amount sufficient to be perceived by the audience, but also to avoid excessive informativeness in educational information given.
- intensification of education on the basis of clearness principles (V.Shatalov, S.Shevchenko etc.). Change of the number and sequence of presenting didactic units with emphasis on the object, its unconventional presentation (selection, images, video, etc.) depending on the needs of the audience will promote concentration and reproducing of logical chain in the learning process;
- the accelerated learning and commenting (S. Lysenkova). Cognitive maps used in the classroom include didactic units, previously considered and related with the material which is studied at the moment and contains elements of future knowledge.
- improving of learning organization and interaction of teachers and students in the classroom (I. Cheredov, S. Kurhanov, V. Dyachenko, M. Huzyk, etc.).

Learning through cognitive maps requires the active cooperation of the teacher and students, according to the learning objectives, which members of the educational process seek to reach, the degree of activity of students is directly proportional to the degree of activity of teachers;

- individualization of learning (V. Volodko, P. Sikorsky, M. Soldatenko, N. Nychkalo, etc.). Specialized software allows us to create associative links that reflect human thinking characteristics typical for human perception and comprehension;
- associative learning theory (Dzh. Lokk, Ya. Komensky). The emphasis on sensory knowledge, enriching the minds of students by the mental images which are presented on the map, helps to form their own subjective mental images that will form the basis of understanding and comprehension of educational material;
- problem-based learning theory (O. Matyushkin, M. Makhmutov, etc.). In our study, one of the main methods of cognitive maps activation for presenting educational information that we have identified is to build cognitive maps based on knowledge and ideas with the reflection of the basic concepts and the relationships between them. The desire of students to search the ways of solving this problem mobilizes their intellectual ability, creativity and motivates them for self-development;
- learning activities theory (V. Davydov, D. Elkonin etc.). When working with cognitive maps, students gain not only knowledge but also form the ability to analyze, systematize, compare elements and relate them to previously acquired knowledge;
- the theory of phased mental actions formation. The process of creating and using cognitive maps, described by us in [Тулашвілі, Олексів 2016: 48–49], corresponds to the structure of the process of learning developed by P. and N. Halperin and N. Talyzina.

According to the model of learning styles created by N. Fleming which is based on earlier models of neuro-linguistic programming and learning processes, which reveal individual psychological characteristics of the cognitive structure of person, his propensity to use different ways of interacting with educational information, there are four basic learning styles defined: visual, auditory, reading/recording and kinesthetic [VARK Learn Limited 2016]. According to the dominant type of perception, human can realize all learning styles mentioned above. It is provided with such visual elements as images, lines, color; combination of video and audio effects that can be added to maps; the possibility of reading and creation of them. With regard to the prevailing kinesthetic perception, the electronic map format ensures moving objects in the working field and brings comfort to the process of creating maps – every object is fixable, can be edited, moved etc.

According to T. Buzan's understanding, «a mind map» is an associative network of images and words which uses the full range of display skills: words, images, numeration, consistency, structuring, color and spatial understanding [Buzan, Buzan 1996: 81]. Presentation of educational information using cognitive maps for the perception of the education subjects is an important step in learning activity. Thus, according to the M. Appler's statement, "mind map is a multicolored, centered image, radial diagram that represents semantic or other connections between parts of the studied material in a hierarchical order" [Eppler 2006: 203].

Mastering the means of cognitive maps creation using mapping software is equally important for the student's assimilation of educational information. In terms of training computer disciplines engineering teachers, we believe that it is advisable to form skills and abilities of students to use specialized software cognitive mapping that enables deep processing of educational information, preparation to its visual reproduction, change of maps' content and their simple dissemination through the network.

After the review of software made to create cognitive maps, we found a sufficient number of freely distributed software that allows to work both in desktop mode and online (FreeMind, The Personal Brain, XMind, Free Mind Map, ScreenHunter Free). Mapping software allows images (pictures, photos, icons, video series), hyperlinks, colors and templates for input, connections between concepts and facilitates the manipulation of objects, restructuring (additions, simplification, structuring, etc.) of cognitive maps.

In preparing computer type engineering teachers for professional activities, they are trained to work with the application XMind. XMind is a cross-platform program for drawing maps and charts running on Windows, Mac and Linux. The program has several versions: free with several disabilities and paid with extended functionality. One of the main advantages of the program is its support and compatibility with the Microsoft Office.

We consider concentration and structuring of educational information as the peculiarity of the stages of cognitive mapping and the use of cognitive maps. Let us consider graphical model of the cognitive map (Fig. 1), which will help us to reveal the capabilities of phases which were mentioned above. These phases are introduced in the process of training future computer type engineering teachers on such subjects as "Internet technologies" and "Computer technologies in educational process". The map shows radiant version of the record, which stimulates associative thinking. In the center of the map is the key concept that carries the main meaning. It departs branches to smaller but important components of the map (it may be certain characteristics, functions of key concept, which is a didactic unit or other educational units closely related to it). The first level of connectivity of educational material presented on the map is limited by these ele-

ments (restriction on the model is a dashed line). The second level provides more detailed subtopics (restriction on the model is line of dots). These levels can theoretically be countless, because all the map is connected by the associative links. With regard to the recommendations of the author, the presentation of educational material in one- or two-level structure is the best option (the principle of simplicity and completeness).

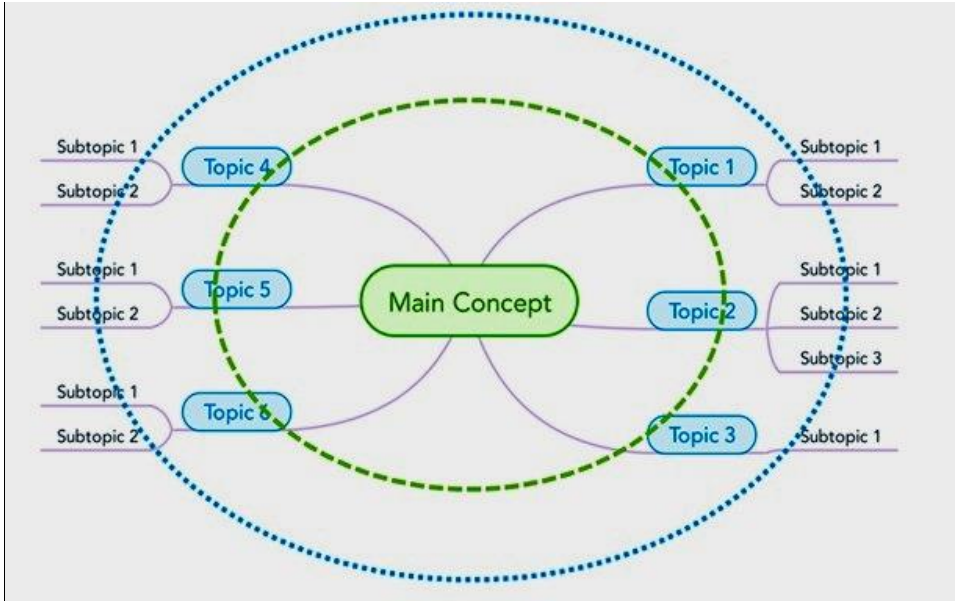


Figure 1. Model of graphic cognitive maps

From our investigation of using graphic cognitive maps in the teaching and learning activities of future computer disciplines engineering teachers, we can determine that the use of cognitive visualization technology provides:

- creating the conditions for active learning activity of students;
- forming the ability for critical thinking and information analysis;
- ability to reflect knowledge by transferring them from the internal to the external plan, i.e. to visualize mental images;
- the development of such important skills for modern professional as information gathering, filtering it by matching, comparing, isolating etc;
- the ability to clearly and concisely articulate points of view;
- concentrating on the important objects at the moment, raising students self-discipline level;
- creativity and imagination development;
- control of quality of educational information mastering.

Conclusions

Disclosure of characteristics of cognitive mapping stages and the use of cognitive maps during the learning activities allow us to conclude that cognitive visualization of teaching objects technology, which is based on the combination of these two stages creates opportunity to:

- reveal the subjective experience of students, including prior learning;
- transform subjective experience gained by controlling the amount of knowledge – structuring, generalization, ordering, integrating of teaching material content;
- correlate subjective experience of students with academic content of knowledge in the learning process;
- promote self-development, interest and need for new knowledge through the choice of presenting the content of teaching material (shape, color, positioning, presence of associative links).

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