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Professional Readiness of Teachers to Use Computer Visualization Tools: A Crucial Drive

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Abstract

The training of teachers involves the formation of skills which are meant to be used in their future professional activities. Given the exponential increase in information content, there is a need to look into the levels and components of the professional readiness of teachers to use computer visualization tools. This article describes the four levels of teachers' readiness [*passive, basic, conscious, active*] to use computer visualization tools. These levels are based on the proposed components of teachers' readiness [*motivational, cognitive, technological, reflexive*] to use these tools.

Keywords: Computer Visualization Tools, Professional Readiness, Teachers, Training.

Introduction

The present training of teachers shows a rapid increase in the magnitude of informational content. To develop the intelligence and thinking of students, there is the need for text data visualization of training materials. The analysis of the scientific and methodological sources confirmed the effectiveness of usage the visualization technology in studying natural and mathematical sciences (Semenikhina, & Drushlyak, 2015; Udovychenko, Shamonya, & Yurchenko, 2015).

Evident in previous works of scientists, visual representation of materials helps to avoid formalism in learning. It also activates innovation, resourcefulness and promotes critical thinking (Semenikhina, 2014; Semenikhina, & Yurchenko, 2014; Udovychenko et al., 2015). To pay special attention to this capacity of visualizing concepts and their properties, it is necessary to understand that professional training of teachers requires the formation of skills to use '*Means of Computer Visualization*' [MCV] (Averbuh, Baydalin, & Bakhteev, 2010).

The formation of visual images is widely used in educational methods. These processes allow information to be transmitted using specialized tools to illustrate any material. Currently, computer visualization is seen as one of the novel ways of transferring ideas or images in virtual space plane (Averbuh, Baydalin, & Bakhteev, 2010; Babych, & Semenikhina, 2014).

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As noted, computer visualization allows students at present to watch the simulation of objects or processes because of their geometric counterparts (images) (Averbuh et al., 2010). Among the distinct means, computer visualization tools can use good software environment to provide dynamic handling of model objects. Substantive knowledge in the field of school education shows that, it is important to focus on object-oriented environments during computer visualization. The use of such means leads to a shift of emphasis in training of modern teacher from being abstract to rather, a technical graduate of modern pedagogical science, who is ready to use MCV in their own careers (Babych, & Semenikhina, 2014).

Special attention revealed by pedagogical works have shown that the concept of readiness is viewed from the functional viewpoint [*as a mental state of the individual individual*] and from the standpoint of personal approach [*as a new growth or quality of the individual*]. Scientists say that the readiness to engage in an activity means that 'state of the individual' is set for the particular type of activity. Thus, there is the need to create the best awareness for all the methods, techniques or means that are needed to aid implementation of such activity. In essence, the readiness for educational activities [*narrow sense*] should be seen as a set of personality traits [*teacher*], which are responsible for the current implementation of educational activities and the later basis for further creative and professional self-improvement (Borovkov, 2003).

To this end, the purpose of this study is to provide a philosophical analysis of professional teachers' readiness to use MCV. This study also offers a review on how MCV uses modern tools to support the learning process. Though theoretical in approach, this paper aimed at providing empirical foundation for pedagogy in modern information society.

Methods

The methodological basis of this article is set up on the philosophical ideas of the modern information society. Much precedence is given to the theory, methodology and practice of teaching disciplines of physics, mathematics and computer science.

To achieve the purpose of this study, the following methods and materials were used:

1. The review of literature related to the investigated problem [*that is, philosophical, psychological, pedagogical and methodological*]. This involve studies in the area of advanced pedagogical experiences, the content of curricula, programs, textbooks, and teaching aids.
2. The modeling of learning activities, which are based on information and communication technologies, including MCV.

Results

In general, the paper shows two major themes under the readiness of teachers to use MCV. These include; (a) levels of teachers' readiness and (b) components of teachers' readiness.

Theme 1: Levels of teachers' readiness to use MCV

There are four different subthemes under the levels of teacher readiness use MCV in professional activities.

1. *The passive level* – is characterized by low motivation to use MCV in learning and creative self-realization; an elementary (basic level) theoretical and technological preparation for the implementation MCV during the learning process. There is a fragmented capacity for analysis and introspection of the educational process. In addition, there is a lack of desire to implement MCV in their own profession, while displaying a passive attitude towards MCV colleagues.

Teachers that fall into this level of formation refer to the MCV implementation as an alternative to the traditional practice of teaching. The basis for this attitude often lack emotional, and intuitive perception of readiness for novel technology and timid attitude towards technical training.

2. *The elementary level* – is characterized by a limited interest in using MCV. It denotes a situational interest to the experience of its use, and a situational willingness to implement MCV tools in professional activities. At this level, there is the need for additional motivation.

In this group, teachers may form fragmentary knowledge about the appropriateness of MCV during different forms of lessons. Though various forms and methods are used, there is an evidence of a rare capacity to attract the use of MCV instruments for education.

Other characteristics at this level include; (a) little professional activities to attract MCV use, (b) an uncertainty in the usefulness of certain MCV tools, (c) the lack of self-orientation based on MCV in the selection and application of teaching methods, (d) no perceived need for mastering MCV tools with additional disjointed interest in the development MCV and their implementation by others, and (e) no desire to experiment is isolated desire for professional growth.

3. *The conscious level* – is characterized by awareness of incentives to take up MCV. It incorporates creativity, self-sufficient theoretical models, and substantive technological training in the field of MCV implementation. Though sufficient professional teachers' interest to learning how to use MCV exists, there is a partial ability to critically evaluate selected tools.

Teachers of this group are generally familiar with the theoretical essentials of education. They also have a sufficient subject knowledge in computer science and mathematics education. They make use of MCV in their own careers, but such usage is often fragmentary and unsystematic. Finally, pedagogical reflection in them is often insufficient.

4. *The active level* – is characterized by a conscious and reasoned motivation for implementing MCV in professional activities. It includes the following characteristics; (a) a creative self, (b) solid theoretical essentials, (c) substantive technological training in the field of mathematics education, (d) the ability to critically evaluate the available tools in the context of the chosen forms and methods, (e) a mature internal readiness for MCV usage, and (f) awareness of the need for continuous review of these tools and technologies.

Teachers of this group are actively experimenting with the introduction MCV, as well as a having developed a good sense of professional reflection. The realization of the creative potential of many of them is an important element of self-realization.

Theme 2: Components of teachers' readiness to use MCV

Under the second theme, this analysis revealed four different component subthemes of future teacher's willingness to use MCV as an individual. These include the following:

1. *The motivation component:* – is characterized by professional motivation and the degree of interest in the future of teaching and learning activities. This component houses the motivation and availability required for professional development. Additionally, it consists of the knowledge of public importance and the ability to maintain a stable professional position. This component promotes the desire for teaching and learning skills development. Motivational component indicators include; (a) the readiness to use MCV to serve the interest of the teaching profession and its activities, and (b) the awareness of the importance of formation using MCV.

2. *The cognitive component* – is characterized by the existing system of knowledge about the educational subjects using MCV in the context of demonstrating such knowledge. This involves the knowledge formation regarding; computer tools, specialized software designed to apply visual methods, and the knowledge of the principles of MCV used in the classroom. The indicators of the cognitive components are (a) holistic knowledge, (b) sound understanding and (c) systematic applications of knowledge.

3. *The technological component* – is characterized by methodological and technological skills needed for providing MCV solutions. This provides meaningful grounds for both educational and professional tasks. There is also the possession of a sufficient level of computer facilities and their conscious usage for professional activities. The indicators are; (a) the technological component of operational skills and technical skills [*the first characterized by formation skills to solve common problems using computer tools MCV, the second – formation techniques MCV used in professional activities*]. Based on the forms and methods of individualization and differentiation, they form ideas about common errors in the use MCV tools and the best ways to overcome them.

4. *The reflective component* – is characterized by the ability to control, check and analyze personal professional and students' activities. This component also involves the self-assessment of activities to improve personal teaching methods and innovative approaches. Indicators of the reflective component are; (a) the ability to conduct introspection and the self-development [*which include the formation of a sense inner readiness to use the tools MCV*], (b) the formation of a critical understanding about the use of MCV, (c) the analysis of the effectiveness of the recognised methods, and (d) the MCV techniques used in the study of mathematics.

Discussion

The analysis shows that the formation of professional readiness is an integral part of a comprehensive training of future specialists. In the context of this study, willingness of future teachers to use MCV was interpreted as the set of personal qualities of students [*future teachers*] to effectively implement ongoing educational activities - based on MCV.

Thus, the philosophical analysis of this paper focuses on the factors affecting the implementation of creative approaches to training and professional growth (Semenikhina, & Drushlyak, 2015). In effect, an active cooperation between teachers and students should focus on the following: (a) the awareness that there is many different software for educational purposes; (b) recognition of MCV among other software; (c) mastering MCV technology tools and their use in solving typical classes problems; and (d) raising MCV awareness for effective learning and subsequent desire to use it. In addition to the need for active cooperation, teachers' readiness to use MCV is essential.

The formation of teachers' readiness to use MCV need to involve the formation of ICT competence as defined by some recent researchers (Babych, & Semenikhina, 2014; Semenikhina, & Yurchenko, 2014; Udovychenko, & Shamonya, & Yurchenko, 2015; Udovychenko, & Yurchenko, 2014; Semenikhina, 2014). Along with professional teachers' training as a key player in the information society. This may impose additional requirements such as: (a) the ability to direct the educational process of the individual pupil or student, and (b) build professional activities accordingly for every student to gain opportunities for continuous development through information tools. Though this describes teachers' professional training, teacher readiness criteria can help their special mental characteristics [e.g. *motor skills, cognitive abilities, especially perception and processing*].

It had been noted over a decade that the professional teacher should consider the availability of motivational attitudes. Such activities lead to an effective means of achieving educational goals, creativity and capacity for reflection (Dychkivska, 2004). It will be contradictory to accept an approach where the readiness criteria serve only the knowledge and skills of teachers. Equally important in the context of teachers' readiness to use MCV is their awareness of the need to introduce MCV in their own practice and to know about new available information technologies.

Conclusion

The formation of readiness to use MCV among future teachers is not only a pedagogical need but a prerequisite for global development. This article presents analysis of studies in the area of MCV usage within the educational settings. The study documented two major themes; (a) levels of teachers' readiness and (b) components of teachers' readiness. This means that each previous level of readiness is a prerequisite for the formation of the next. The timely and objective definition of a particular level gives access to appropriate self-development and self-improvement, which are important professional qualities. The use of MCV will have considerable impact on the; innovativeness of teaching methods, task assignment, research, motivation of teachers and students to overcome the difficulties of methodological, technical, personal character, and creativity needs. These factors affecting teachers' readiness to use MCV will have an impact future teachers' experience during teaching practice and future professional work.

Conflicts of interest statement

The authors declare that they do not have any conflict of interest.

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