

Management of Educational and Cognitive Activities of The Future Teacher Through the Introduction of The Technology of Educational Animation Design

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Abstract. The purpose of this paper is to describe the current method of managing the educational and cognitive activities of the future teachers in the process of general pedagogic training through the development and implementation of an original educational animation design technology. The attainment of this goal is presented in the paper in the logic of an innovative cycle, which reveals the genesis of its creation from an idea to practical approval. The authors used the following research methods: theoretical analysis, comparative analysis, ascertaining experiment, modeling, prototyping, pedagogical experiment, survey, observation, descriptive statistics. The authors describe the experience of implementing the educational animation designing technology in the process of general pedagogical training of future teachers (using the example of the Physics and Informatics program at the Belarusian State Pedagogical University named after Maxim Tank). At the end of the course, the students created original animated videos on physics as part of practical work in their pedagogy course. The potential of the developed technology as a means of managing the educational and cognitive activities of future teachers was implemented through the dominant diagnostic variable, i. e. the quality of the formed competencies in the Pedagogical systems and technologies course. As a result of the pedagogical experiment, it was confirmed that this technology allowed managing the educational and cognitive activities of modern students, helping to deal with mosaic thinking which is a specific feature of modern youth and that it was an effective technology for the general pedagogical preparation of a future teacher.

1 Introduction

Achievements of scientific and technological progress determined the dominance of multimedia resources among the means of information transfer. It is important to note the

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fundamental difference between the cognitive processing of various types of resources: while reading texts implies a clear, ordered perception in a linear structure, the processing of rich audio-visual information resembles a wave. The presence and redundancy of audiovisual information have led to the emergence of the phenomenon of mosaic thinking, which implies a contraction in the rate of processing information by weakening the barrier to conscious perception. One of the distinguishing features of the educational activities of modern students is "observation instead of reflection" [1-3]. Taking into account this feature of information processing by modern students [4], including future teachers, we developed an educational animation design technology that allows for effective management of educational and cognitive activities of future teachers and included it in the process of their professional training, following modern requirements [3].

2 Methods

The prototype of educational animation design technology was our positive experience in implementing an additional education program for preschool teachers and elementary school teachers to master the original animation methodology "Ya tvoryu mir" ("I create the world") (by N. S. Murohodhodzhaeva) as part of the STEM-education program for children of the preschool and primary school age [5-8].

An ascertaining study, which included a survey of 203 future teachers, students of the Belarusian State Pedagogical University named after Maxim Tank, revealed a positive attitude to the use of educational animation design technology and readiness to master it in the educational process [5]. Available foreign studies on various aspects of the problem of using animation in the educational process have confirmed its positive impact on academic performance, educational motivation and the reduction of anxiety among students [9, 10]], substantiated its use based on problem teaching methods for school students [11] and college students [12] and revealed the potential of its application in physical and mathematical subjects [13, 14].

Under the technology of designing educational animation, we understand the specific type of pedagogical design activity to create original animated products, focused on the effective achievement of educational goals and objectives. We included this technology in the process of general training for future teachers [15].

The animation used in education is different from the animation in the general sense. The traditional definition of animation technology is photography that uses the frame-by-frame shooting of objects and continuous playback to form movement. Regardless of the subject, the shooting is performed in the frame-by-frame mode, and continuous playback during viewing forms an active image, i. e. animation. The principle of creating animation is to reflect the actions of characters, changing scenes and present them in a frame from a variety of moments of action, using a camera to shoot a series of frames, simulating continuous movement in a visual picture. From a biological point of view, it has been proved that people have a feature called "vision continuity". After the human eye sees a picture or object, the image of that object in our brain will not fade away for 0.34 seconds. Using this principle, reproducing the next image before the first image disappears will result in a smooth visual change effect. The basic principles for creating animation are the same as for films or television (the principles of short-term audiovisual perception).

For educational animation with a didactic plot plasticine animation is most appropriate, like in the "Ya tvoryu mir" ("I create the world") studio. We have accumulated positive experience in the use of additional education for teachers of preschool and primary education in the process of our pedagogical work [6, 16]. The set of the "Ya tvoryu mir" ("I create the world") studio includes equipment (prefabricated screen; a set of backgrounds; a set of magnets), software (a CD computer software; a webcam); methodological support (step-by-

step instructions in the form of questions and answers; a training manual for working with the animation studio).

The technology of designing educational animation in the training of future teachers has a dual function: it allows a future teacher to master the principles of creating educational animation so that in future professional activities they can create their educational animation independently, and also invite their students to take part in its collective creation, which, undoubtedly, will help realize its didactic and developing potentials.

The educational value of animation is not so much the technique of their creation, but the educational idea that the author wants to convey to their audience [17]. Therefore, before starting to make animation, one should choose an aspect of the lesson, which can be transformed into a script for an educational animated video, and develop a storyline that requires communication and discussion in a group, draw up a small plan, determine the style of work and script. In this regard, as adequate pedagogical technologies that allow us to organize work on the creation of educational animations, we considered such pedagogical technologies as Mosaic, Student Team Learning (STL), Learning Together and Research work in groups [18-20].

We further describe the pedagogical technology for the design of educational animation, which was tested as part of the practical work of the Pedagogical systems and technologies course.

1) Explaining the essence of creating animation, introducing students to existing animated works, so that students get a general idea of the result (it can be done in a lecture or during preliminary independent work).

2) Formation of groups consisting of 3-4 students, distributing equipment for educational animation, selection or assignment of the topic of the lesson (the subject depends on the specialty of future teachers).

3) Work in groups on fragments of material: selecting a plot in the topic of a training session → developing a script → choosing or creating a background → creating characters → frame-by-frame shooting → coherent animation → dubbing → full animated video (up to 7 minutes). At this step, the teacher must not tell students about the problems and solutions that they may encounter at the beginning. They solve the problems independently doing practical work, carefully listening to the opinions of teammates, making notes in notebooks, consulting their training materials, lectures, in case of difficulties asking the teacher, etc.

4) Experts' meeting. Students from different groups who study the same context communicate as "experts" on specific issues, for example, "What should I do if the inserted background is gone?", "How to set the shooting angle?", "How to shoot a flying object?", "How to understand the technique of shooting horizontally, on the sides, above and below?", etc.

5) Return to groups and training. Participants return to the groups and teach other members of the group to improve the initial animation and refine its aesthetic aspects. After that, each group makes a report on the skills that they have acquired.

6) Viewing and examination of created educational animated videos (it can be done at a lecture or in the process of distance learning, or asynchronous viewing). At this stage, you can vote for the best work and/or encourage its creators (by giving them good grades, posting animations on the official website of the educational institution or a YouTube channel, recommending them for participation in a methodological competition, etc.).

The formative experiment was conducted at the Physics and Mathematics Faculty of the Belarusian State Pedagogical University named after Maxim Tank (from February to April 2020) as part of the Pedagogical systems and technologies course (2nd year, 4th semester). A group of students studying Physics and Informatics was divided into two subgroups (within the framework of the provided practical classes) representing the control and experimental groups, with 13 students in each group. In the formative experiment in the control group,

practical studies were carried out based on the proposed technology. At the same time, the lectures on Technologies for organizing students' cognitive activities and Technologies for effective management of the learning process contained an additional question, "Technology for the educational animation design".

3 Results

The quality of the formed competencies in the Pedagogical systems and technologies course was chosen as the dominant diagnostic variable. The performance score for the course, the assessment of the performance of high-quality tasks, and reflection data were the indicators. The data obtained and their statistical analysis showed a higher quality of the formed competencies in the course in the experimental group than in the control group in all respects (during the randomization procedure at the control stage): the academic performance score in the course in the experimental group was 8.1, which is 1.4 points higher than in the control group; the performance of high-quality tasks in the experimental group was evaluated by independent experts 1.6 points higher than in the control group; the reflection data showed a 23.7% greater satisfaction from the educational process in the experimental group than in the control group. Besides, the obtained experimental data and their statistical processing indicated the positive impact of the technology of designing educational animated videos on the cognitive activity and independence of future teachers, the activity-related, and motivational components of educational and cognitive activities.

4 Discussion

In the experimental group, in the process of implementing the technology for designing educational animation in practical classes by students (future physics teachers), educational videos were created on such topics as "The conservation of momentum", "The Archimedes' principle", "The acceleration of free fall", "The friction force". Within the framework of one training session, these educational videos were not full-fledged educational products, but the main educational value here is the mastery of innovative educational technology of a reflexive and active nature by future teachers, allowing them in the future to optimize both their pedagogical activity at the stage of preparation for classes and students' educational activities in class, using this technology as the main one during certain classes.

5 Conclusion

The proposed original technology for the design of educational animation and the experience of its implementation in the process of general pedagogical training of future teachers using the example of the Physics and Informatics program allows us to consider it as an effective means of managing the educational and cognitive activities of the future teachers, allowing them to take into account the specifics of thinking of modern youth (mosaic thinking) and level its influence by activating the motivational and activity-related components of educational and cognitive activities.

The restriction on the use of the proposed technology for the design of educational animation in the lessons is associated with the need to use special equipment. However, given the focus of modern higher education institutions on providing technical training during the educational process, as well as the focus on the development of mobile applications, it can be argued that this factor will not have a significant impact on the pedagogical value of technology and not limit its extrapolation to other educational institutions.

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