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Using Means of Multimedia for Teaching International Students Geometrical Issues of Computer Graphics in English

In the 21st century, one of the educational tendencies in the developed countries is to attract international students to get education in the country. As statistics demonstrates the most spread language in the world is English, it is the mother tongue or a second language for nearly 600 million people and about 1.5 billion people are learning English as a foreign one [1, P.18]. Today almost 30 non-English speaking countries, propose educational programs in English [1, P.18]. The main challenges for teaching and learning in multicultural groups of students in foreign language are the language proficiency both of the students and the lecturer, different academic discipline background and special terminology. In this paper, we present some approaches of using computer technology for teaching one of the most complicated but impressive topics «Geometrical Issues of Computer Graphics» in multicultural groups of art oriented students. The methods proposed are gained from experience of teaching «Fundamentals of Information Technologies» for Master's students in the Belarusian State University of Culture and Art.

In the Belarusian State University of Culture and Art the intended audience of the course «Fundamentals of Information Technologies» are not mathematicians and, as a personal experience of the author shows, the majority of students attending the course are not even math-friendly. But in the modern world in which the methods of teaching are developing with the same speed as technology does, a lot of technological means can be used to overcome the poor mathematical background of students and to make the ideas of the mathematical basics of the computer technology clear. The mathematician William Goldman Bloch., the author of the brilliant book for mathematicians and not mathematicians «Unimaginable Mathematics of Borges' Library of Bible», in his book wrote «If, however, an unimaginative education or a particularly unpleasant teacher left a lingering distaste for all things mathematical, I hope this book acts as a corrective. Mathematics can be creative, whimsical, and revelatory all at once» [2, P.8].

Today technology helps students to understand the mathematical processes, which are «governs» the society and nature, more deeply due to visualization and animation. Even not being mathematicians, specialists from different research spheres successfully use mathematical techniques such as statistics, information theory, topology, geometry and graph theory etc. in their investigations. The main objective of this course is to give the students mathematical instruments, which can be successfully used in their research or creative activity. Thus in the first part of the course the topics of geometry of plane and fractal geometry are discussed. The ideas from this part of the discipline are very useful for painters, musicians, dancers and even linguists.

For delivering lectures and holding seminars on «Fundamentals of Information Technologies» today, the classroom, especially for multicultural audience, needs all the modern equipment such as projectors, multimedia board and high speed Internet. In this case more than ever suitable saying «Better to see once than to hear a hundred times». To give the explanation of quality on some topics within short period of time some online-resources need to be available during the lectures and classes.

Lectures and labs on Geometrical Issues of Computer Graphics are designed in interactive form. The Lectures on Fractals presuppose students to make some tasks, solve problems and then take a floor and explain to others how the tasks could be completed. During the labs students can discuss the difficulties which they meet and to overcome them together. The main principles of the designing lectures and labs on the Geometrical Issues of Computer Graphics are presented on the base of the Lecture on Fractals.

The design of the lecture. At the beginning of the lecture the introduction of the topic and objectives of the lecture are presented. After introductory part, students are given some examples of the fractals depicted on the pictures of nature or computer artworks. They are proposed also to use on-line fractal builder [3] to watch and understand the process of building geometrical fractals as Serpenski Triangle and Pythagoras Tree. The task is to guess what fractal means, finding out the principles of

selfsimilarity. Then students are given five minutes to read about fractals using their mobile devices in their native language. After that lecturer explains fractal, using examples from different disciplines such as physics, mathematics and nature.

The next step is to give an understanding of iterative process. To achieve an objective the algorithm of Koch curve building is discussed. The meaning of «iteration» is highlighted. Some mathematical tasks are proposed to students for self-solving. Then the volunteer explains the problem solution to the audience. It is not forbidden to give an explanation in native language when the students group has the same native language.

Building of other geometrical fractals is studied with help of online tool – fractal builder that is accessible on the internet-portal [3]. The resource maintains only Russian language, but it has brilliant tools for building geometrical fractals iteration by iteration. The tool can be used on the students mobile devices. Students are divided on small groups, each of them being given one geometrical fractal to build and guess the algorithm. They discuss the algorithms in the small groups and then volunteers explains the algorithm studied by the group to all students.

Next step is the discussion of fractal geometry in the nature forms. The question to answer after discussion the fractal forms of nature is «what is the difference between geometrical fractals under consideration and nature fractal forms?». The Listeners should understand the presence of random choice in the nature. Any algorithm and algorithms with random choice can be easily programmed with computer tools. This means that objects of the nature can be also modulated using the computer fractal algorithms. Indeed, in the computer graphics fractal algorithms are used to «draw» the nature, and also objects from real and unreal world without painter. The brilliant example of using such fractal graphics is the film «Doctor Strange» (2016).

At the end of the lecture the five minutes film about using «Doodal» program to draw the fractals is demonstrated. In this film, examples of drawing nature objects with fractals are also presented.

For home study. Last ten minutes of the lecture are dedicated to complex numbers which are the base of dynamical fractals. Then students are given a home work. They should to watch 4 five minutes films about complex numbers which are accessible on online educational internet-portal «Khan Academy» [4] and make online test proposed on this resource. The films have subtitles in different languages including Chinese. This helps students with low level of language to understand the theme of flowing lecture better.

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