Education of student’s project team cooperation using virtual communication supported by LMS system

Stepan Hubalovsky  
Faculty of Science  
University of Hradec Kralove  
Hradec Kralove, Czech Republic  
stepan.hubalovsky@uhk.cz

Josef Sedivy  
Faculty of Science  
University of Hradec Kralove  
Hradec Kralove, Czech Republic  
josef.sedivy@uhk.cz

Abstract—The paper deals with possibilities of the training of cooperative method of teaching using virtual communication environment. Virtual communication can be not only objective but also a means of education. It is based on the different fields; this type of education helps to consolidate a number of interdisciplinary relationships.

Keywords—computer graphics; project learning; team based learning; virtual communication, virtual learning;

I. INTRODUCTION

Active methods of education – the methods which are similar to management of project – are applicable in the high school education in practice-oriented teaching as well as in collaborative student work on common themes (technological, economic, environmental or engineering projects) in the context of teamwork - team based learning. This methodology focuses to the students' problem-oriented cooperation within the group. The educational objectives are, in this case, not only perform of the desired task (which is assessed by standard methods of evaluation units, aimed at assessing the "outputs" of the educational process - the knowledge and the skills), but also the planning process solution, together discussion on various aspects of the problem solution, etc. (i.e. the development of social skills which is the added value of such education). Addressing the task in this case takes place not only in instrumental terms, but also in social term – it is important to choose a common strategy corresponding to the principle of the problem, its objectives and the ability of the student’s team. The e.g. ethical issues have to be very often solved. Usually it is also necessary for students to identify themselves with the problem to be solved and worked with the problem, not only according to their individual abilities and preferences, but also a way that corresponds to the accepted social role in the group. In the reality, however, a large part of communication between members of the team is lead by virtual form - either by the network through standard office applications, or by specialized environments supporting the direct collaboration.

II. TEAM COOPERATION, TEAM MANAGEMENT AND TEAM COMMUNICATION IN VIRTUAL ENVIRONMENT AND ROLE OF TEACHER

The Secondary School of Applied Cybernetics in Hradec Kralove in 2008 has been introduced the project teaching under the support of the LMS system within project days. This project learning supplements the standard teaching. Individual projects are implemented by teams of students of different grades and different disciplines of study. There is a significant strengthening of cross-curricular links – see [1]. One of the realized projects engaged in parametric modeling was called Virtual tour objects. Issues of working with virtual reality are supported by the control system LMS Moodle.

The concept of working with virtual reality is in principle based on integration of different disciplines. They are programming, parametric modeling and computer graphics. Therefore, the project involved students of given study disciplines. Students of discipline “computer graphics” in all the years of study at the beginning has classical art training, as well as a number of complementary disciplines focused on the acquisition of graphics software technology. It should be noted that the participants of the project consists of two non-homogeneous groups of future experts of different professional focus, some are technically oriented (programmers), others are more artists. Ensuring a functional and constructive cooperation between those groups of students is complicated and difficult for the organization. At the same time, however, simulates real projects. One of the main objectives of this activity is to acquire the ability to work as a team, communicate with each other and respect the different working needs of students with other professional affiliations.

The main role of the teacher in the practice of teamwork is not only the support of the individual learning processes, but also to create conditions for social learning, i.e. to gain the situation where students themselves take on their experiences, critically evaluate their opinions and agree on strategies for common goals. In this sense, the set up of the work team can be understood us setting up of the social environment, which enters into the learning process, forms the relationships influenced the results. Team building and its continuous support are important and default elements of this type of
education. Emphasis on structure and dynamics of the group are two of the four fundamental principles of learning in teams: First, teams must be properly formed (e.g., students should be appropriately divided into different groups according to their diverse skills, intellectual talent, etc.). Second, the kinds of tasks for each team must promote both learning and team development (tasks requiring interaction in the team, to be carried out jointly by all members).

All students learn computer graphics, technical drawing and parametric modeling within compulsory education. It all happens first by standard teaching and later in the project management virtual education supported by LMS systems. Here it was chosen as the initial system Moodle for their availability and prevalence. Teachers also have some experience with it. The relevant software applications, in which the project are created, performs the function of creative tools and is not the core problem in terms of the principles of the process of teamwork training. This application environment was elected program Inventor 11, because it has an extensive student support and the opportunity exists to purchase the student version to computer for free. The possibilities of parametric modeling in this program are very broad and correspond to engineering practice. The core of work directed towards virtual reality projects is the parametric modeling. The organization of creative teams is a matter of pedagogical and psychological experience of an experienced teacher. The teacher has to be equipped with technical knowledge of the program Inventor also know the personality traits of team members. It can occur spontaneously provision of creative teams that work based on team roles. Learning to solve problems lies in the fact that the student acquires the ability to independently find methods and strategies of solution and makes decisions in alternative situations. The actual technical creative process is based on the using the examples from the fields of engineering and construction. Knowledge of the accurate modeling and the engineering drawing is for students of artistic disciplines necessary for later attending of practice-oriented subject Design and realization, which is focused on the foundations of architecture, industrial and graphic design. In parallel from the beginning of the study subject 3D modeling is taught too. Applied systems for free artistic creation and animation are enhanced by a large number of sophisticated tools for creating the square models (also called polygon). Teaching of these subjects is also supported by multimedia applications. Multimedia applications support so called technology learning (technology-based training). They enable providing information, training materials and educational content through various forms of electronic media. They are part of e-learning.

III. APPLICATION OF THE ALTERNATE METHOD IN LEARNING OF VIRTUAL REALITY

A substantial part of the education process is own experience and skill of each student. Specifying the problem and its solution can be provided by teacher, but it can be found by students themselves. Learning method by discovering [2] expected that the principles will by found mostly by student alone, sometimes with help of teacher. If the method is a well-planned, it represents active form of learning. Student using this method can quickly understand the subject matter. But this method of discovering is not fully sufficient. Students must have pre-acquired basic knowledge and skills that are necessary to cope with the task. They also need to understand what is expected from them, the task must be clearly defined and formulated. Performed activities have to be adequately difficult that most students will be able to implement them. Student must be carefully monitored and possibly help them. Different groups of students require different levels of management. Before teacher intervenes in the students learning, they should provide an opportunity to reach their own solution. Discovery method is active, motivating and fun. It aims to understand the subject of matter on the basis of existing knowledge, skills and experience.

A. Project method in education

Next preferred method of education is project method, which is, according to [3] characterized by changes in the arrangement of the curriculum with regard to solving of specific project. This method is similar to the problem method, but the project method is focused to practical solution of the task, while the problem method is based on mental solution.

Within our project different working methods have been realized and various software technologies have been applied. Regardless of the specific field of study first-year students have limited knowledge, so it is expected from them accomplish a task easily. The task is to create an interactive virtual tour of the existing physical environment, such as the school interior. Input can be relatively easily implemented by web service developed in cooperation with Photosynth by Microsoft Live Labs and the University of Washington.

The first phase of the task is the acquisition of significant numbers of digital photographs of the environment, individual images cannot be random. For proper function of these services it is necessary to create pictures in accordance with a number of specific rules that students can acquire from the information resources available via the Internet. Taken photographs in the supported data formats are through the user interface sent to a remote server. After analysis of their similarity the spatial simulation is generated. Students of art have in the first year graduate course under the guidance of professional photography expert. Students of Programming attend compulsory courses focusing on the creation and use of Web technologies.

Create a virtual tour of the environment is only available through a Web interface and is stored on a remote server. This virtual simulation cannot be saved and distribute through own personal computers. The application code cannot be changed or extended its functionality by final user. Such problems can be eliminated through other technologies such as applying VRML (Virtual Reality Modeling Language) or standard X3D (eXtensible 3D), which is built on the VRML97 concept and supported by syntax of XML (eXtensible Markup Language).

B. Virtual reality as the goal and means of the learning

Making extensive scenes and rugged shape models rendered in real-time requires a different system approach see
Textures can be created by students using techniques low-poly bump mapping, procedural maps and textures and complex material. Collision objects are also imported into the assembly scene. Low-polygon models are formed using techniques such as SolidWorks, Autodesk Inventor Professional or Dassault Systèmes SolidWorks, the second part of the art team is creating various methods, e.g. for loading models from data files, communicating with the graphics hardware, control consoles and control camera movement, detection of collision, lighting and scene and others. Through the Internet, relevant educational materials are again available. Virtual tours of models are compared with a mere drawing documentation or model in a CAD system much more illustrative - see [7]. For example, the interior can be designed based on real ideas of interior house. Resulting work fulfills the function of teaching aids. Visual presentation draws attention, arouses interest and can also be a motivation tool - see [8].

C. Creation of multimedia teaching supports

For job description and graphic display of the detail in the environments of different graphical systems is essential recording of high definition video. Usually it depends on every proper and sharp of move of the mouse cursor. Tentative moves of the mouse cursor or any search of menu of software applications within the lecture presentation is for students confusing. Similar is using the keyboard shortcuts that are not in the desktop visually apparent. Most graphics applications allow efficient work just using shortcut keys, applying them in lectures presentation, however, is largely inappropriate. But students should be informed of their existence [9].

Adobe Captivate is appropriate tool for creating interactive multimedia learning supports, simulations of run and operate various software applications. While working in environment of graphical editor images of his desktop and events from the keyboard and mouse are stored. In edit mode, it is possible to record of desktop images extended by voice comments, text descriptions, raster images in different data formats, audio-visual sequences in Microsoft AVI format (Audio Video Interleave), by a simple vector graphics, by Microsoft PowerPoint presentations, and possibly some interactive elements (buttons, references, etc.). The resulting work can be stored in the form of executable applications (Windows executable), or Microsoft AVI file format supported by Adobe Flash (such as SWF, FLA, FLV). The advantage of this option is minimal knowledge of the user. Sensing image of the computer desktop can be using other software tools (e.g. TechSmith Snagit, Hyperionics Technology LLC HyperCam) formatted to compressed visual sequences in Microsoft AVI format without the demands of free hard drive data space. Audio commentary can be stored simultaneously or independently. Quality of audio recording depends on the sound card and external microphone. Work place on which the audio-record is formed, should be suitably acoustically adapted, because different noises in the audio recording has negative impact and can destroy the entire results of their work. Applying background music is not suitable in technical learning films because it disrupts concentration, image and voice commentary requires maximum concentration of the students. Video and audio record can be synchronized by of audiovisual application SW such are Adobe Premiere, Sony Vegas and Canopus Edius. Large number of audio and video tracks can be cut to realize record, modify the reproduction speed of its individual parts, apply various transition effects and filters, add subtitles, etc. The structure of a possible future optical media, timelines, chapter, subtitle and multi-language

For maximum control of polygon networks, the possibility of transformation, modification of normal vectors, etc., it is appropriate to propose own data format. The first part of the programming team is therefore creating plug-in using internal language called 3DS Max MAXScript. It enembles export data files into the structure of polygon networks and materials, mapping coordinates, texture and more - see [6]. The second part of the team creates their own application for rendering. Individual students involved in the formation of various environments of different graphical systems is essential recording of high definition video. Usually it depends on every proper and sharp of move of the mouse cursor. Tentative moves of the mouse cursor or any search of menu of software applications within the lecture presentation is for students confusing. Similar is using the keyboard shortcuts that are not in the desktop visually apparent. Most graphics applications allow efficient work just using shortcut keys, applying them in lectures presentation, however, is largely inappropriate. But students should be informed of their existence [9].

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set, etc. can be realized through the applications and sophisticated tools such as Adobe Encore or Sony DVD Architect. For compressing the resulting record is necessary to use easy available codec as a group of MPEG (Motion Pictures Experts Group). Voice comment is used primarily to widening image perception. Therefore, voice commentary of the learning applications should convey only information that the video clearly does not arise.

IV. CONCLUSION

The paper presented computer graphics as computer discipline that can be viewed in many ways and can be notionally divided into different categories. These categories are closely interrelated and mutually intertwined. Their training cannot be isolated to the individual subjects, objects or modules (e.g., raster or vector graphics) or software applications. Virtual learning methods and current development of information technology brings substantial changes in the forms of education and provides opportunities for effective application of alternative teaching methods, problem and project teaching, creative development and team work. Teaching of computer graphics and in particular the parametric modeling helps to develop spatial thinking. This can develop student’s cognitive abilities that are necessary for dealing with different spatial relationships.

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