Improving student motivation by means of Multimedia

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ABSTRACT

The student's motivation is one of the most actual problems in the universities. One of many reasons for increased number of cases for low-level student motivation is that there are many more students in the higher education system with relatively low level of preparation. As a result, because of complex material delivered to students and their low ability to learn quickly, the motivation of students to learn programming and maths can be decreased significantly during educational process. In order to overcome this problem, the means of multimedia can be used in the educational process.

The basic idea of proposed approach is to use the PowerPoint presentations, multimedia applications in the teaching process during both lectures and tutorials. The basic material should be accessible by students at any time. In order to do this, the material mentioned above should be published in Internet and intranet. The most complex material is implemented using a lot of animation in the lecture and tutorial material with relatively high frequency of repetition. It can be noted that in some cases the students become more motivated, once they understand the basic idea. The accessibility of material and its possibility to repeat it a lot of time have increased the level of student's knowledge gained and have improved their motivation.

1. INTRODUCTION

One of the difficulties to teach programming and maths in the modern universities lies in the student motivation. Unfortunately one of the reasons that the students are low motivated to study a technical subject is the poor understanding of the basics of this subject at the first place. It is very difficult to teach the structural language such as maths or programming if the educational background of students is not relatively high. In this case the expectation of failure of subject by students is very high.

One of the ways to overcome this problem can be in attempts to increase the student motivation. Visualisation of the complex concepts and the independent assessments and internet-based material can do it. In this case the student can study subject independently. Understanding of subject by student can lead to increase the number of "want" to learn motivations and to decrease the number of "need" to learn motivations.

The Internet and multimedia technologies can be used in order to organise the independent learning and increase the "want" to learn motivation. One of the advantages of Internet and multimedia technologies over the standard one lies in the opportunity to access the teaching and learning material by student at any time. The success can be only achieved in

the case if the computer-based technologies will be actively used during all stages of teaching and learning processes, such as lectures, seminars and assessments.

One of the main points of the approach discussed in this paper is to combine all means of computer-based technologies at all stages of teaching and learning processes. In this case the lectures and seminars have to be very close related to each other. Performing the assigned tasks student has to have the constant access to the lecture material in both paper-based and electronic formats. The author argues that the campaign to address and increase the students' motivation levels may best be effected by paying attention both to the "need" and the "want" to learn continuously through all aspects of teaching using computer-based technologies in the teaching and learning process very actively.

2. FACTORS INFLUENCED ON THE SUCCESSFUL LEARNING

There are five factors, which underpin successful learning that have been mentioned in [1], [2].
- "wanting" to learn (intrinsic motivation);
- "needing" to learn (extrinsic motivation);
- learning-by-doing – practice, trial and error, experiential learning;
- learning from feedback – finding out how the learning is progressing;
- making sense of what has been learned – digesting.

Note that there are two factors that involve motivation in the successful learning. Obviously, the student self-motivation is one of the main factors influenced on the successful learning. So, it is worth to have a look at the opportunity to make the student interested in the subject and, therefore, to improve his/her self-motivation. One of the ways to improve the student self-motivation is to build up his/her self-confidence at the first time. In this case the computer-based technology involved in the everyday teaching and assessment can be one of the solutions to the problem mentioned above. Thus, it is worth looking at how the computer-based technology incorporated in the everyday teaching and assessment processes can enhance the motivation factors. Moreover, since the other three factors are linked to motivation [1], [2], all five factors need to be taken into account in the design of teaching, resource-based learning and assessment.

3. COMPUTER-BASED TEACHING AND INTRINSIC MOTIVATION

One of the most important factors in the "want" to learn is the student's interest in the particular topic being learned. The intensity of the want to learn depends very much on this factor. In other side, the "need" to learn is appeared when there is a topic that students don't like very much. Let us notice that in some cases even if the student needs to learn a subject he/she does not spend enough time because of lack of interest in the subject. Let us consider this issue using a simple example.

At the Electronic and Computer Engineering Department, Brunel University the engineering students have to learn the programming concepts during first and second year of study. After first year of traditional study one can notice that the number of students who have lost interest to the subject has been increased. At the same time the students' confidence in the subject has been diminished significantly.

One of the reasons for this is that the students have relatively poor mathematical background and they are not prepared to study more complex concepts such as programming. In order to overcome this problem the means of multimedia and Internet can be used.

The module discussed further contains both procedural and object-oriented programming concepts in C/C++. The students had background of procedural programming in Pascal. It has been required within one semester consider at least two basic sub-modules: C/C++ and object-oriented programming. In order to obtain the best results in students' learning of material the computer-based means have been used in teaching and learning processes. For this particular case, the lectures and assessment for the second year students have been delivered using PowerPoint presentations, flash animations, publishing material on the World Wide Web and multimedia software.

Power Point presentations

PowerPoint has been chosen as a presentation software package since it allows us to produce the high-quality transparencies, to implement relatively simple animation and to publish material on the World Wide Web with notes dedicated to each slide. PowerPoint presentation has been used to deliver lectures. In this case the animation has been implemented in order to explain the basic concepts of the programming and point out the most important issues of this concept.

For example, the concepts of structures and linked lists using dynamic memory allocation have been considered as one of the most difficult concepts in the procedural programming. The implementations of structures, dynamic memory allocation and linked lists have been explained together with visualisation of processes that are carried out in the program. In this case for each highlighted line in the considered program segment, the corresponding animation performed in PowerPoint has been carried out. This concept allows student to visualise the processes, which are carried out in the program during its execution. At the same time it helps them to understand without good mathematical background how the basic programming operators work. Thus during lectures it has been not only delivered new material, but also it has been revised the material that the students learnt during first year of study. The revision has been incorporated into the teaching process in such way that the weak student can learn material once again using visualisation techniques.

Reaction of students: It is necessary to note that the reaction of students on the delivering of the lectures using PowerPoint presentation has been very interesting. This was their first experience with delivering lectures using laptop and PowerPoint facilities. Therefore, during first lecture they paid a lot of attention to the facilities used during lecture rather then to the material delivered. But as time goes, the number of students engaged in the learning process has been increased. It has been noticed that some weak students has started to participate in the lectures.

Flash animations

Animation using Flash software has been used in the teaching process in order to visualise the most complex concepts. Note that this type of animation is difficult to implement using only PowerPoint. In this case the separate movies have been created for each of topic used. The flash animation has been used to introduce the concept of object-oriented programming. The basic ideas of the objects, the relationships between objects, and the actions of objects have been demonstrated using flash movies. In order to make understanding of concept easier for

students it has been used some analogies between real life and basic concepts of object-oriented programming.

Reaction of students: The flash movies have been used during lectures as well as on the lab sessions. During lab sessions the students had opportunity to play each movie separately in order to understand the basic concept. During lectures, it was obviously much easier to explain the material using flash movie and animation. It could be easily seen that the students picked up the basic ideas quicker using animation. At the same time, almost nobody was wishing to use the flash movies during lab sessions. It could be explained by those that it was not enough information inside of movies in order to proceed the learning independently.

Publishing material on the World Wide Web

In order to make the material accessible by students at any time, the lecture notes with some explanations for each slide have been published on Internet. The purpose of this is that the students, who were unable to attend the lecture, can learn material by themselves studying or revising the lecture notes and any additional material independently. The structure of published pages includes the links to each topic, studied at the lectures; the bookmarks to each slide; the slide and some explanations accompanied each slide.

Reaction of students: At the beginning of semester only published material has been available to the students. As a result it has been received a lot of complains that the traditional paper-base handouts have not being given to the students even if they have been supplied with the internet page where they can find all information. Later the students have been supplied periodically with lecture notes and the Internet has been updated all the time. The result of questioning the students shows that some of them used more actively the material published on the internet and another one – paper-based material. At the end of semester it has been obtained some requests to supply a bit more information on the web and if it is possible – publish the flash movies there as well.

Multimedia software

The special multimedia software has been developed for those students who have some problems to understand the basic concepts of programming. The developed multimedia software contains two main parts – the lecture notes and the tutorials. The tutorial material has been closely linked with lecture notes. Thus if the student answered the question wrongly, he/she was given an opportunity to revisit the lecture material by providing the links to the corresponding lecture notes. Each lecture contains a number of slides. Each slide contains some graphical illustration or animation and the explanation of material in words. The animation can be controlled by student and can be played several times, if the student desires so. Each tutorial contains a number of questions for each delivered lecture. If the answer of question has been wrong the link is provided in order to help the student to find the material that he/she needs to revise. Each student gets some score after each completed exercise in the tutorial. The multimedia software has been developed to help students understand the basic concept of object-oriented programming. The multimedia material has been accessible for students only during lab sessions.

Reaction of students: The tracking technique has been used in order to understand the use of multimedia application by students. It has been noticed that the number of students revisited

the lecture material has been increased once the score has been introduced in the system. Usually a student has repeated the tutorials several times until the maximum score has not being achieved. Thus, the students have been motivated to learn material by introducing the score system in the multimedia application.

Once the lectures and tutorials have been delivered to the students, the questionnaire has been prepared. The result of questionnaire shows that the students have considered the concept of object-oriented programming as much easier to understand then the procedural one. It has been a lot of requests to make the developed multimedia application accessible for students at any time. The result of assessment shows that the students understand the basic ideas of object-oriented programming very well. The students have been accessed by examination at the end of semester. They have been given choice to choose two questions out of four. The questions have covered the following four topics: functions and procedures in C/C++; the architecture of computer; object-oriented programming and structures. The majority of students choose a question related to the object-oriented programming.

4. MOTIVATION THROUGH LECTURES

One of the problems with modern student is that he/she doesn't like to take any notes during lecture, relying on the fact that the most basic and important material will be provided by lecturer. In this case the student can be actively participate during lecture since he will receive all necessary information later on. The student who makes notes during lecture learns more then the passive one. In order to motivate the student to be more active during lectures the following technique has been used. In the lecture notes and in the PowerPoint slides the mistakes have been made deliberately. During lecture the material on the slide have been explained several times until students will sport the mistake. At the beginning of semester it was very rarely to find a student who will have a pen. Once the technique mentioned above has been used, the number of students taking notes has been increased. At the same time the number of students actively involved in the lecture has been increased significantly. The students have started to pay more attention to the material, which is delivered during lecture. If the slide will be explained several times, they would start carefully investigate the content of the slide. Using active learning during lecture helps us to involve more students more actively in the teaching/learning process. At the same time the students are motivated to attend the lectures and participate in the teaching and learning processes more actively since the corrections can be made only during actual lecture.

5. TEACHING, LEARNING AND ASSESSMENT USING MODERN COMPUTER-BASED TECHNOLOGIES

Let us summarise the technique that has been used to deliver "C/C++ programming" module using both PowerPoint presentations and multimedia applications. The PowerPoint presentation is used to deliver the lecture material. The flash animation is used to explain the most complex concepts. The advantage of flash animations is that the student can replay it very often. The lecture material with comments to almost each slide has been published in the Internet. The material has been accessible for all students of the course. The multimedia applications have been used to deliver the basic concepts of the subject. At the same time the multimedia application has been used to deliver tutorials that provide learning-by-doing.

The table 1 summarises the technique that has been explained above. This technique is based on the idea of using the computer-based technologies in the teaching and learning processes to increase the student's motivation and their successful learning. As it can be seen the multimedia software can be used in any learning process and at some point can replace the PowerPoint presentations. However, it takes more time to produce one lecture using multimedia rather then using PowerPoint. This is the main drawback of using only multimedia applications can be overcame by using combination of PowerPoint presentations and multimedia software. The students have been given the choice how to learn a material. The proposed technique covers such type of learning techniques as resource-based learning, web-based learning and multimedia-based learning. Therefore it can satisfy any student.

The analysis of the questionnaire given to the student at the end of semester shows that the students prefer to use both traditional and non-traditional methods of learning. The number of students' responses to "I am interested in learning the subject" obtained at the end of semester was a higher then the number of similar responses obtained at the beginning of semester. Therefore, the motivation of students has been improved using the proposed techniques of teaching and learning. The majority of students like the idea of teaching using both PowerPoint presentations and multimedia applications. At the same time some of the students prefer to use some traditional methods of study rather then the computer-based. It is noticeable that it has been obtained much better response about using the developed multimedia application rather then any other computer-based technique.

Table 1. The computer-based material used to deliver module "C/C++ programming"

	Lecture	Tutorial	Independent learning	Assessment
PowerPoint presentation	√	×	×	×
Flash movie	√	√	√	×
Web-pages	√	√	√	×
Multimedia software	√	√	√	√

6. SUMMARY

The most productive approach to the learning and teaching processes is to try to enhance *all* of the main (motivation) factors, which are known to underpin successful student learning [2]. The present paper offers some suggestions to improve the current teaching and learning process using computer-based technologies. It could be seen that Internet and multimedia technologies provide the new basis for the teaching and learning processes.

9. REFERENCES

[1] Race, P and Brown, S (1998) *The Lecturer's Toolkit*, Kogan Page, London.
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