Designing and Evaluation of the Computer Aided Teaching Material about Reproduction of Plants

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SYNOPSIS

INTRODUCTION

The fact that science generally includes abstract concepts makes it compulsory to have an education full of experimental activities. The hindrance of many attempts in this field due to the lack of physical facilities, inefficiency of teachers leads to seeking for new approaches to teach science (Çepni, Ayas, Johnson & Turgut, 1997; Kabapınar, Özden & Salan, 2000; Altun, 2001; Demirci, 2003). Computer aided teaching in science is one of these approaches. Therefore, developing software for computer aided teaching in science and its evaluation forms the main part of this study.

Kılç and Sağlam (2004) reported that students have difficulties in learning and understanding biological topics as they are abstract, and have Latin words and complex relationships among concepts. Therefore, researchers indicate that biology teaching and its practices should be based on the visualisation of the relationship between biological structures and biological functions. Virtual learning environments achieve these aims by providing three dimensional (3-D) environments, allowing them to interact with virtual objects and showing the results of these interactions on the screen (Yu, Brown & Billet, 2005). Technological developments and new methods in education have formed up computer aided teaching as an alternative choice in which animation and simulation is used efficiently in biology teaching instead of traditional teaching in biology (Çakır, 1999). Computer animations may facilitate students’ comprehension of biological concepts and make them interested in the topic as presenting opportunities to them to learn by seeing (Çalışkan, 2002). It is also reported that computer animations can help reducing misconceptions in students (Bahar, 2003; Türkmen, Dikmenli & Çardak, 2003; Lin, 2004). The topic of plant and plant growing is one of the biological subjects in which students have various misconceptions about. Therefore,
developing software for computer aided teaching can a great extend decrease student misconceptions in the topic of plants and plants growing and increase their understanding and success.

There is various computer software in either biology or the other science fields. However, it has been reported that these software do not meet the educational expectations and receive many criticism because of their poor quality (Özdener & Erdoğan, 2001). Therefore, in planning and designing computer software for teaching, software evaluation measures should be taken into consideration (Akbulut, Akdeniz & Dinçer, 2008). In the evaluation of a teaching software, four main measures such as teaching appropriateness, teaching programme appropriateness, structural appropriateness and programming appropriateness should be considered (Şahin & Yıldırım, 1999).

PURPOSE OF THE STUDY

The main aim of this study parallel is to evaluate the applicability of the computer aided teaching material on the topic of the reproduction of plants in the 10th Grade Biology Programme by the Biology students at undergraduate and graduate levels. In this regard, the following research questions are going to be answered:

1- Is the computer aided teaching material about the reproduction of plants appropriate to the use of secondary students?
2- Can the computer aided teaching material about the reproduction of plants help secondary students to learn the subject effectively?
3- Is the computer aided teaching material about the reproduction of plants prepared in order to remove students’ misconceptions related to the topic?
4- What are the views of the Biology undergraduate and graduate students on the usability of the computer aided teaching material in classes?

The fact that it was not come across with any computer based teaching material on this topic including all subtitles in the literature review of this study shows the importance of this study.

METHODOLOGY

a) Research Approach and Method

Mixed Research Approach including qualitative and quantitative research approaches together (Miles & Huberman, 1994; Cohen & Manion, 2000; Creswell, 2003; Çimer, 2004) was adapted in this study. Survey research design (Robson, 1997; Cohen & Manion, 2000) was used.

b) Designing Materials

In this study, the content of the computer aided teaching material on Reproduction of Plants is determined according to the textbook used at the tenth grade level in secondary school. Macromedia Flash 8 programme is used in the preparation of the material. In order to provide valid content, the content and structure of the material was shown to and controlled by 10th Grade Biology teachers in Trabzon, lecturers in the department of Secondary Science and Maths Education Department, Biology Education Program, of Fatih Faculty of Education at Karadeniz Technical University (KTU). In terms of technical issues regarding programming of the material, experts and graduate students at the department of Computer and Instructional Technologies of Fatih Faculty of Education at KTU.
c) Sample

The sample of the study includes 49 4th and 5th grade biology education students and 12 biology graduates from the department of Secondary Science and Maths Education Department, Biology Education Program, of Fatih Faculty of Education at KTU.

d) Data Collection Tools

In the study, as the data collection tool, Teaching Software Evaluation Form prepared by Gülbahar and Tinmaz (2006) was used. There were both close- and open-ended questions, providing both quantitative and qualitative questions. There was a five-point Likert Scale. The points to comment the sufficiency level of the teaching material were determined as following: “1.00-1.79: Very poor”, “1.80-2.59: Poor”, “2.60-3.39: Average”, “3.40-4.19: Good” and “4.20-5.00: Very good”.

e) Data Analysis

The quantitative data gathered was analyzed by the use of SPSS 15.0 programme for Windows. The findings were tabulated including mean scores, standard deviation and standard error values for each item of the questionnaire. The answers to the open-ended questions from Biology teacher candidates’ and biology graduate students’ were analysed qualitatively and shown as quotations in the research report. Qualitative data was analyzed in the categories of “Teaching appropriateness”, “Teaching Programme Appropriateness”, “Structural Appropriateness” and “Programming Appropriateness / Technical Sufficiency of the Material”.

FINDINGS

In terms of teaching appropriateness, the computer aided teaching material was received the highest point form the function of “Increasing motivation” (4.45) whereas the lowest point was received from the function of “Caring for individual differences” (2.67). In the open-ended questions, the participants also found the material attractive, interesting and motivating for students. They also indicated that the software explain abstract concepts clearly and makes the classes enjoyable. Therefore, they emphasised that they would like to use the material in their lessons as a teacher.

Regarding teaching program appropriateness, the material was given the highest point for “Including different materials, supplying teaching” (4.23) and the lowest point for “Acknowledging for studying duration” (2.72). In terms of visual efficiency, the computer aided teaching material was also given the highest point by the participants for its “Colour harmony” and “The use of screen” (4.20) and the lowest point for “Plainness of screen designing” (3.18). In general, in the open-ended questions, they reported that they liked the qualities of visuality, audial presentation, animations, virtual laboratories and screen design. Especially, many participants stated that the screen was so lively because of having attractive colours, shapes and enjoyable designs.

In terms of “Programming appropriateness / Technical Sufficiency”, the material was received the highest point for “Working with no delay” (4.37) and the lowest one for “Printing Facility (3.00)”.

The general average of the points of the four categories of Education Software Evaluation Form was 3.76. In the general evaluation, “Visual efficiency” received the highest point (3.61) whereas the item of “Teaching programme appropriateness” obtained the lowest one (3.59). According to these results, it might be said that the participants’ views on the
material was found positive and it was considered useful for secondary students even though there were some small mistakes in the text, questions, and animations, reported by the participants.

DISCUSSION

Planning, development and the evaluation of the course software include a serious and deep study. Good quality software increases the success of students whereas an ill-prepared one leads students to waste their time and gain undesired learning behaviours (Oğuz, 1995; Güzeller & Korkmaz, 2007). This study is intended to develop a useful software and then, evaluate it in terms of its appropriateness for teaching a biological unit.

Yıldırım (2001) suggests that for creating a computer aided teaching software, it is necessary to use various elements to address more student senses. Therefore, for his aim, in the preparation the material in this study, animations, simulations, voice, and text were used.

The success of the computer based teaching method is mostly depend on the quality of the software. Therefore, the software should be appropriate to the aims of the teaching program and the level of the students to learn. Also, in developing teaching software, teaching and learning principles and the nature of the topics to be taught or learnt should be taken into consideration and they should be prepared as a result of a cooperative effort by the experts in the fields of education and computer technology (Güzeller & Korkmaz, 2007).

RESULTS

It is seen that computer aided teaching material about the Reproduction of Plants has been found positive by the Biology students at undergraduate and graduate levels. Since the overall evaluation of the material in terms of the four categories of the Education Software Evaluation Form is pointed higher than the average 3.40, it can be said that the material is at “good” level and has appropriate qualities for teaching biology. Teacher candidates have found the categories of “Teaching appropriateness” and “Visual efficiency” better than the others, so it is possible to say that the material is at “good” level ($X = 3.76$) as an educational software and thus, this can be accepted as a success of the software. The most common thing that the participants paid attention is that the material will help both teachers and students, and make students more active during the lessons. One of the most emphasized elements of the material by the participants is its visual characteristic and attractiveness. Therefore, it is thought that the material will be effective to motivate students for learning in the lessons and make Biology lessons interesting and enjoyable. On the other hand, the participants reported some small mistakes in the text, questions, and animations.

SUGGESTIONS

In this study, a computer aided teaching material for the topic of plants reproduction was developed and evaluated by biology students at undergraduate and postgraduate levels. In the preparation of the material, more emphasis should be put on providing valid knowledge in the editing of the animation and simulation. In addition, it should be included various elements into the material in order to address more student senses as the more senses it is addressed to, the more permanent and effective learning is achieved by students. The success of the computer based teaching method is mostly depend on the quality of the software. Therefore, the software should be appropriate to the aims of the teaching program and the level of the students to learn. Also, in developing teaching software, teaching and learning principles and the nature of the topics to be taught or learnt should be taken into consideration and they should be prepared as a result of a joint effort of the experts in the fields of education and computer technology.
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