7th Grade Students’ Views On Combining The Use Of Computer Simulations And Laboratory Activities In Science Teaching

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Abstract

The aim of this study was to investigate 7th grade students’ views on combining the use of computer simulations and laboratory activities in science classes. A qualitative approach was used with 27 students in grade 7. The data were collected through four open-ended questions developed by the researchers and analyzed using content analysis. As a result of the analysis, the students stated that they learnt faster, and the lessons were more interesting and enjoyable compared to the previous ones. In the light of the findings we suggest that computer simulations and laboratory activities can be used as mutually complementary in science courses.

Keywords: Science teaching, computer simulations, laboratory activities, students’ views.

1. Introduction

With the rapid development of information and communication technology (ICT) the use of computer technology in science education has become commonplace. ICT addresses visual and auditory senses, the use of educational technology facilitates learning and teaching in many courses. Waight and Abd-El Khalick (2007, p. 155-156) stated that technology is also used in science teaching in many forms such as the micro-computer based laboratories (Adams & Shrum, 1990; Nakhleh & Krajcik, 1994; Settlage, 1995), simulations and micro-words (Geban, Askar, & Özkan, 1992; Roth, 1995), interactive video discs, multimedia, hypermedia (Turner & Dipinto, 1992; Yildirim,
Ozden, & Aksu, 2001). e-mail and internet (Mistler-Jackson & Songer, 2000; Songer, 1998). Among these, computer simulations provide interactive, authentic and meaningful learning opportunities for learners. Simulations facilitate the learning of abstract concepts since students would have the chance to make observations and get instant feedback (Bell & Smetana, 2008). Research in science teaching reveals that computer-assisted learning is as effective as the laboratory method (Starrus & Knize, 1994; Yang & Heh, 2007). Besides, combining the use of computer simulations and laboratory activities has been found to be more effective than the use of the individual strategies (Jaakola & Nurmi, 2007; Jaakolao, Nurmi & Veermans, 2010; Koyunlu Ünlü & Dökme, 2011; Taner, Önder & Silay, 2010; Zacharia, 2007; Zacharia & Anderson, 2003; Zacharia, Olympiu & Papaevripidou, 2008). While designing a learning-teaching environment, it is important to evaluate the quality of students’ views, attitudes and beliefs. In this context the aim of the study was to reflect on 7th grade students’ views on combining the use of computer simulations and laboratory activities during science teaching and learning. The research question of the current study was "What are the views of 7th grade students’ on the use of combining computer simulations and laboratory activities in the Science and Technology course?"

2. Method

2.1. Research Design

A qualitative approach was used in this study since it reflects 7th grade students’ views on combining the use of computer simulations and laboratory activities in a Science and Technology course.

2.2. Participants

A total of 27 (13 male and 14 female) 7th grade students from a state school in the central Anatolia region of Turkey participated in the study. The students were informed in advance about that the data gathered in this study would be used only for research purposes and their names would not be mentioned in any part of the study.

2.3. Procedure

The study was conducted in the 2009-2010 school year after a three-week intervention involving four hours of instruction each week over 12 hours in total. Thirteen computer simulations and eleven laboratory activities were developed by the researchers for the "Electricity in Our Lives" unit in the Turkish Science and Technology Curriculum (TSTC). The lessons were carried out in the computer laboratory where the necessary equipment for the activities were made available. Working in groups, the students first studied the simulations on basic electrical concepts, and then performed the activities using the laboratory equipment provided.

2.4. Data Collection Tool

A semi-structured written interview using a form containing four open-ended questions developed by the researchers was used as the data collection tool. After the form was distributed to the students, they were given 25 minutes to respond to the questions. The questions were intended to reveal students’ views on combining the use of computer simulations and laboratory activities. The questions in the written interview were as follows:

1. What do you think of conducting the activities using computer simulations along with experiments in the science and technology course? How did it help you understand the subject?
2. Do you think computers should be used in science teaching and other courses?
3. What do you think of learning about electrical currents with combining computer simulations and laboratory activities compared to your previous science classes?
4. What do you think of the "science laboratory" and "virtual laboratory"? Do you think the laboratories will be virtual in the future?
2.5. Data Analysis

The data gathered through the interview form were analyzed using content analysis. The raw data is coded categories are defined. Coding and categorization process was carried out repeatedly by the researchers.

3. Findings

In this study, data about 7th grade students’ views on the application of combining simulations and laboratory activities in the science and technology course were obtained. The data were summarized in tables to facilitate understanding.

Question 1. What do you think of conducting the activities using computer simulations along with experiments in the science and technology course? How did it help you understand the subject? The participants’ answers to Question 1 are presented in Table 1.

Based on Table 1, the students’ answers to Question 1 can be gathered under two categories, i.e. learning and having fun. The students stated that the intervention facilitated understanding, enabled faster, permanent and effective learning, and increased the level of achievement along with mastering the subject. The views of some students regarding Question 1 are as follows:

Kübra O.: "Doing it both on computers and in real (activities) makes it both fun and easy to understand. I think it is better for us if they allow us to do the experiments both on computers and in the laboratory."

Kübra S.: "We have done lots of activities since the 4th grade. This the first time we have done an experiment on a computer. This is better because the teacher explains answers to the questions, and we do those things on computer by practising. In this way, I better understand the subject and the lesson becomes more enjoyable and easier to understand with both experiments and equipment."

Pınar Ç.: "We comprehend the subject better. The lessons become more enjoyable. I believe that I will get higher marks in science class than in other classes.

Question 2. Do you think computers should be used in science teaching and other courses? The participants’ answers to Question 2 are summarized in Table 2.

Based on Table 2, the students’ answers to Question 2 can be gathered under two categories, i.e. learning and having fun. The students stated that computers should be used only in science course or in all the courses.
Based on Table 2, the students' answers can be summarized under two categories, namely “they should be used in all the courses”, and “they should be used only in the science course”. Most of the students argued that computers should be used in all the courses. The views of some students regarding the question are as follows:

Hamzi Y.: "I think computers should be used only in science class. It is fun because it is colorful and visual. Moreover, we learn by practicing."

Erdoğan Y.: "Computers make us understand better and (enable us to) master the subject. However, we can't use it in math class because we mostly perform mathematical operations."

**Question 3.** What do you think of learning about electrical currents with computer simulations and laboratory activities compared to your previous science classes? The participants' answers to Question 3 are summarized in Table 3.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Codes</th>
<th>No. of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better</td>
<td>It provided effective learning</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>It enabled better understanding</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>It enabled faster learning</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>It is enjoyable and fun</td>
<td>22</td>
</tr>
<tr>
<td>The same</td>
<td>It is better if our teacher explains</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>We learn from both</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 3 shows that most of the students thought the intervention was better than in previous lessons. The views of some students are as follows:

Gonca Gül D.: "In our previous lessons, we didn't use computers with laboratory experiments. However, our lessons are more enjoyable now and we understand better."

Gül O.: "Usually, it is the same, we learn well both ways."

**Question 4.** What do you think of the "science laboratory" and "virtual laboratory"? Do you think the laboratories will be virtual in the future? The participants’ answers to Question 4 are summarised in Table 4.

<table>
<thead>
<tr>
<th>Categories</th>
<th>No. of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratories will be virtual with the advent of technology</td>
<td>18</td>
</tr>
<tr>
<td>No idea</td>
<td>2</td>
</tr>
<tr>
<td>There should be both</td>
<td>7</td>
</tr>
</tbody>
</table>

According to Table 4, while some of the students thought that the laboratories would be virtual with the advent of technology, some others stated that they had no idea. The views of some students regarding the question are as follows:

Hamzi Y.: "Virtual laboratories may be possible in the future. I believe that it will make great contributions to learning and teaching."

Kübra O.: "In (science) laboratories, we do experiments with equipment, but in virtual laboratories with computers. Both are good for us. I think we should have both. They will be beneficial for our learning."

Kübra S.: "Laboratory is related to science laboratory and equipment. Virtual laboratory is doing experiments using computer simulations. This way is better and we understand better when and how to use computers. Laboratories should be virtual in the future, the importance of computers is recognized. Learning via computers facilitated my learning process. After all, I enjoy anything with computers. I think computers should be used not only in the science course but also in other courses in the future."

**4. Conclusion and Discussion**

As a result of the analysis, the students stated that the use of combining computer simulations and laboratory activities facilitates understanding, provides faster and permanent learning, mastering of the subject, learning by
doing, and increases the level of course achievement as well as making the lessons enjoyable and fun. Similarly, Lowersion, Sclater, Schmid and Abrami (2004) found that students in their study thought using computer technology was valuable for learning. The finding that the students viewed that they learnt faster is also in parallel with the findings of Bell and Smetana (2008). Likewise, in their study with engineering students, Balakrisnan and Woods (2013) revealed that the students found simulation laboratories and real laboratories entertaining, and thought that these two applications complement each other. Also Jaakola and Nurmi (2007) stated that using computer simulations together with laboratory activities can help to bridge the gap between theory and reality. Accordingly, computer simulations and laboratory activities, depending on the facilities, can be used as mutually complementary in science courses.

References


