THE EFFECT OF EBA AIDED TEACHING ON STUDENTS’ HEAT-TEMPERATURE AND MELTING - DISSOLVING CONCEPTIONS

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Abstract

In this study, the question of if the computer aided instruction remediates the misconceptions of elementary fourth grade students about “heat-temperature” and “melting-dissolving” was aimed to be determined. The study was designed according to pre-test and post-test experimental group design. The population was fourth grade students attending a primary school in Niğde, Türkiye during 2014-15 education and instruction year. The sample was 96 students, who were attending three primary schools at Yesilgolcuk district in Niğde. The research took a total of 12 hours during four weeks. The researcher made use of the videos and animations of Morpha Campus and Okulistic electronic contents in Education Information Network (EBA) to teach experimental group students by computer aided instruction. Misconception Test was administered to both experimental and control group students. The data were analysed by t test and Crosstab. SPSS Statistic 22 software was used in these analyses. As a result, Morpha Campus and Okulistic e-contents in EBA eliminated more misconceptions of experimental group students. Moreover, outgoing misconceptions were also decreased with the use of EBA instruction.

Keywords: Misconception, Computer Assisted Instruction (CAI), Education Information Network/ Eğitim Bilişim Ağı (EBA), science and technology, elementary students

Introduction

Concept is a mental tool that prompts the individual to think and makes them meaningful while making them think [1]. Concepts are the basis of science teaching. Teaching the concepts correctly helps science teaching reach its goal. For the science concepts to be taught to students to be meaningful and permanent, the newly learned concepts and existing concepts should form a meaningful integrity [2]. If inconsistencies occur in students’ minds about concepts, the effectiveness of teaching and even learning is hindered. Misconceptions are also defined as ideas that are resistant to classical teaching methods and generally do not overlap with scientific concepts [3]. Looking at the literature, there are other definitions of misconception. The common point of these definitions is; emphasizing that misconceptions cause the individual to learn incorrectly.

In order for a piece of information to be counted as a misconception, it must meet three consecutive conditions: the student's idea is not compatible with real science, the student should try to seek scientific evidence or explain in order to defend this wrong idea and be sure of his own answers [4]. The most important difference that separates the misconception from the wrong information is the individual's assuming that he knows the concept correctly. If we want to remove the misconception in the educational environment, first, we need to know the reasons well. Factors such as the fact that the Science and Technology course consists of many abstract concepts and includes more complex mental activities than other courses will make concept teaching difficult. In this case, it may cause some students to interpret concepts differently and have misconceptions [5]. [6] talked about the misconceptions in the literature about heat and temperature.

EBA (Eğitim Bilişim Ağ, in English - Education Information Network) is an online, social education platform run by the General Directorate of Innovation and Educational Technologies of Turkish Ministry of Education. It aims to harmonize technology with education by using IT tools in every area needed at home and at school, ensuring the effective use of materials. In addition to the content prepared by education companies, it is also possible to access e-content prepared by volunteer teachers in EBA. These e-contents will be accessible in any environment where the internet is available. In this way, learning will come out of the four
walls and take place anywhere that can be reached. Considering all its features, EBA will provide equal opportunities and opportunities to students across the country by providing access to the same e-contents all over the country [7].

With the use of computers in the classroom, interest in studies investigating the effect of Computer Assisted Instruction (CAI) on student achievement has increased. Chemistry is a discipline that is difficult for students to understand because it contains abstract concepts that cannot be observed at microscopic level in daily life and the language it uses is difficult for students and teachers have difficulties in explaining concepts related to chemistry. Studies have shown that CAI applications are effective in seeing molecular interactions at the particle level and visualizing events that occur at the microscopic level, that student learn concepts more effectively and meaningfully, and that they can answer conceptual questions more scientifically about events that occur at the particle level. It has been stated that animations help to realize meaningful learning, provide conceptual understanding and understand abstract concepts, and are effective in displaying chemical events. It has been seen that animation-simulation applications at the particle level not only help students to understand the particulate structure of matter, but also enable them to explain microscopic events. It has been revealed that CAI applications help to concretize abstract concepts, improve understanding, facilitate remembering, and associate concepts with daily life.

Some animations used in the classroom reduce the knowledge to a micro level, they do not have an effect on students' understanding of the subject and verbal explanations are absolutely needed, so applications such as animation and simulation should be supported with auxiliary materials [8]. The contribution of CAI to the cognitive development of students in science education is discussed. With EBA, it is aimed to provide equality of opportunity among students and to enable students to access information everywhere. In the year, the study was conducted, the basic concepts of science were being taught in the fourth grade of primary school. The concepts of heat-temperature and melting-dissolution, which are among these concepts, are constantly confronted by students since the science curriculum is in a spiral structure. It is very important to teach these concepts well. Based on the explanations above, "Is there an effect of EBA supported teaching in eliminating the misconceptions?" This constitutes the problem situation of this study. With this study, it is aimed to examine the effect of EBA supported education in eliminating the misconceptions of "heat-temperature" and "melting-dissolution" subjects of primary school fourth grade students.

Methodology

Research Design
In this study, quantitative research method was applied. Experimental study, pre-post-test control group was designed according to the quasi-experimental model. As seen in Table 1, MT, which was developed to determine students' misconceptions, was administered as a pre-test and after four weeks as a post-test.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Experimental Procedure</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>MT</td>
<td>EBA aided constructivist teaching</td>
<td>MT</td>
</tr>
<tr>
<td>Control</td>
<td>MT</td>
<td>Guidebook aided constructivist teaching</td>
<td>MT</td>
</tr>
</tbody>
</table>

NOTE: MT: Misconception Test

Population and Sample
The population of the study is the fourth-grade students studying in 15 town schools in the centre of Nigde, Turkiye in the 2014-2015 academic year. The sample of the study consists of the fourth-grade students of all primary schools (three primary schools) in Yesilgolcuk Town, which is connected to the Merkez district Nigde province. The number of schools in these towns varies from one to three. There is one primary school in eight towns, two in five towns, and three in two towns. Except for one of the towns (Sazlica Town), the others are on the state roads connecting Nigde to Kayseri and Nevsehir. Except for the town of Sazlica, there
are 22 primary schools in these towns. The schools in Yesilgolcuk town, which was determined as a sample, correspond to 14% of this number. This shows that the sample size represents the universe. Sample selection was made according to convenient sampling, one of the non-random sampling techniques. When using this sampling, it is asked whether the participants who will take part in the study are suitable or not, or a study group is formed in which it will not be difficult to participate in the study [9]. In the selection of the sample, the students in this town were chosen because the researcher worked in this town and it was easy to access the experimental and control groups.

The students of two branches in the school where the researcher works constitute the experimental group, and the students of one branch in each of the other two primary schools constitute the control group. While the number of students in the experimental group was 46, the number of students in the control group was 48. The researcher taught the lessons of the experimental group. Since the traditional method was applied in the control group, their own classroom teachers taught the lessons. Before the application was made, the teachers in the two schools were informed in detail about the study. The sample consists of 96 people. Students who could not come to school on the days of the pre-test and post-test due to some reasons were not included in the study.

**Preparation of Measurement Tool**

In the "Let's Get to Know the Matter" unit of the 4th grade primary school Science and Technology course, there are six acquisitions covering the "heat-temperature" topics and three acquisitions covering the “melting-dissolution” topics [10]. Many studies have been done on this subject. Studies to eliminate or detect misconceptions about "heat-temperature" and "melting-dissolution" were examined. Based on seven misconceptions about this subject [11] [12] [13] [14], a 14-question MT was prepared.

Obstacles to obtaining accurate results in experimental studies should be estimated and necessary precautions should be taken. For the research results to be interpreted meaningfully, internal validity should be provided as a prerequisite and attention should be paid to external validity [15]. After the questions were prepared, an expert lecturer, two Turkish teachers, two classroom teachers and a science and technology teacher examined them. Thus, it was tried to minimize the errors caused by the exam. Even if the students do not know the correct answer to the questions, the tests include the possibility of giving the correct answer to that question. With two-stage tests, it also minimizes the possibility of random answers to questions that students do not know. In two-stage tests students express the reasons for the answer they chose in the first stage and in the second stage [16].

The 14 questions in the MT consist of a two-stage test that requires classification [16]. The first stage consists of the parts to be marked as true or false. The second stage is the part where the student explains the reason for marking the correct or incorrect answer given to the question. On the other hand, the student who gave the correct answer to both stages was given 3 points. The student who gave the correct answer to the explanation of the staged part was given 2 points. The student with a misconception was given 1 point, and if the student's answer was irrelevant to the topic or answered without understanding the question, 0 points were given.

The first question was “Bulent watches the weather bulletin after the evening news. The presenter of the news said that the air temperature in Nigde is 15 degrees, the temperature in Kayseri is 18 degrees. Bulent thinks that the presenter of the weather forecast used a wrong expression. In your opinion, is Bulent true or false”. Sample scoring for this question is shown in the table 2 below.

<table>
<thead>
<tr>
<th>score</th>
<th>answer</th>
<th>1st step</th>
<th>2nd step</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Correct</td>
<td>It will be “air temperature” rather than “air heat”</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>True/False</td>
<td>It will be “air temperature” rather than “air heat”</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>False</td>
<td>The news presenter gives accurate information.</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>False</td>
<td>There is no such weather in the countries.</td>
<td></td>
</tr>
</tbody>
</table>
Application Process

The lessons have been prepared in accordance with the annual plan in the guidebook, considering the course durations there. It was planned to cover three lesson hours a week, and the study, which lasted for four weeks, to cover 12 lesson hours in total. EBA supported constructivist teaching was applied in the experimental group. Since the course aid materials (projection device, projection screen, computer, and sound system) were available in the classroom, the experimental group lessons were taught in this class. There are three hours of science and technology classes per week. The lesson was divided into 2+1 and the lesson planning was made accordingly. In this way, students were prevented from getting bored with the lesson. Firstly, the students were shown the animation related to the subject. After watching the animation, they were asked questions about the subject that could reveal their misconceptions. Students were allowed to experience mental conflict in order to construct knowledge. Thus, it was ensured that students noticed the misconceptions. An experiment was conducted in the classroom and the students were personally involved in the learning environment. Finally, the activities in the students' workbook were carried out. A daily lesson plan was prepared by using the guidebook in accordance with the learning outcomes and activities for the lessons of the experimental group. The experimental group students did not use the textbooks. The reason for this is the use of e-contents in EBA instead of textbooks. The activities in the workbook were made by the students in order not to fall behind the curriculum.

The students of the control group are in two different schools. Due to the transportation conditions in the town and the distance between the schools, the teacher of that class taught the lessons. Before the application process started, the researcher went to both schools and made detailed information about the study. Control group lessons were taught in accordance with the teacher's guidebook prepared by Doku Publications. The students made the activities in the course and workbook. Experiments in the guidebook were carried out. The activities planned using the constructivist teaching method in the control group was carried out during 12 lesson hours.

Data Collection and Analysis

MT was applied twice with a duration of four-week. The data obtained within the scope of the research were brought together by using the Microsoft Office Excel program. SPSS 22.0 (The Statistical Packet for the Social Sciences) package program was used for the analysis of the gathered data. Significance level in statistical calculations was accepted as .05. When the significance value was found to be less than .05 (p<.05), the differences between the groups of independent variables were accepted as “significant” and the results were evaluated accordingly. The parity of the groups was tested with the independent samples t-test. The difference between the mean MT scores is 0.24 in favour of the experimental group. Since the number of students in the sample was not equal, when the t value was taken in cases where the variances were not equal (t(73.71)= 0.20, p = .840), it was seen that the difference between the averages of the groups was not statistically significant. Therefore, in terms of conceptual understanding, it can be said that the experimental and control groups started to work on the same level.

Findings

To better see the answers given by the students based on the questions, the cross table (CROSSTABS) was made. The data obtained because of the cross-tabulation are gathered under four main headings and shown in Table 3. The four main titles created were determined according to the score to be obtained from the MT:

- Unaffected: shows the number of students who got two points in the pre-test, got two points in the post-test, got three points in the pre-test, and got two or three points in the post-test.
- Wrong answer: When MT is applied as a pre-test and post-test, it shows the number of students who scored zero against the answers given by the students in the post-test.
- Ongoing: this group shows the number of students who scored a point on the students' post-test.
- Resolved: In this group, the number of students who got zero or one point in the pre-test, two or three points in the post-test, two points in the pre-test and three points in the post-test is shown.
Table 3: Comparison of answers of experimental and control group students from pre to post MT

<table>
<thead>
<tr>
<th>Item</th>
<th>group</th>
<th>unaffected</th>
<th>ongoing</th>
<th>resolved</th>
<th>wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>f (%)</td>
<td>f (%)</td>
<td>f (%)</td>
<td>f (%)</td>
</tr>
<tr>
<td>1</td>
<td>experimental</td>
<td>5 12.5</td>
<td>18 45</td>
<td>16 40</td>
<td>1 2.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>1 2.5</td>
<td>29 72.5</td>
<td>10 25</td>
<td>0 0</td>
</tr>
<tr>
<td>2</td>
<td>experimental</td>
<td>12 30</td>
<td>10 25</td>
<td>17 42.5</td>
<td>1 2.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>14 35</td>
<td>13 32.5</td>
<td>11 27.5</td>
<td>2 5</td>
</tr>
<tr>
<td>3</td>
<td>experimental</td>
<td>8 20</td>
<td>12 30</td>
<td>19 47.5</td>
<td>1 2.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>14 35</td>
<td>15 37.5</td>
<td>11 27.5</td>
<td>0 0</td>
</tr>
<tr>
<td>4</td>
<td>experimental</td>
<td>2 5</td>
<td>18 45</td>
<td>17 42.5</td>
<td>3 7.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>3 7.5</td>
<td>32 80</td>
<td>5 12.5</td>
<td>0 0</td>
</tr>
<tr>
<td>5</td>
<td>experimental</td>
<td>1 2.5</td>
<td>34 85</td>
<td>5 12.5</td>
<td>0 0</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>0 0</td>
<td>37 92.5</td>
<td>2 5</td>
<td>1 2.5</td>
</tr>
<tr>
<td>6</td>
<td>experimental</td>
<td>11 27.5</td>
<td>12 30</td>
<td>13 32.5</td>
<td>4 10</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>21 52.5</td>
<td>10 25</td>
<td>9 22.5</td>
<td>0 0</td>
</tr>
<tr>
<td>7</td>
<td>experimental</td>
<td>1 2.5</td>
<td>32 80</td>
<td>4 10</td>
<td>3 7.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>2 5</td>
<td>34 85</td>
<td>4 10</td>
<td>0 0</td>
</tr>
<tr>
<td>8A</td>
<td>experimental</td>
<td>0 0</td>
<td>13 32.5</td>
<td>26 65</td>
<td>1 2.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>1 2.5</td>
<td>12 30</td>
<td>27 67.5</td>
<td>0 0</td>
</tr>
<tr>
<td>8B</td>
<td>experimental</td>
<td>11 27.5</td>
<td>2 5</td>
<td>22 55</td>
<td>5 12.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>12 30</td>
<td>0 0</td>
<td>18 45</td>
<td>10 25</td>
</tr>
<tr>
<td>8C</td>
<td>experimental</td>
<td>21 52.5</td>
<td>0 0</td>
<td>10 25</td>
<td>9 22.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>32 80</td>
<td>1 2.5</td>
<td>5 12.5</td>
<td>2 5</td>
</tr>
<tr>
<td>8D</td>
<td>experimental</td>
<td>18 45</td>
<td>0 0</td>
<td>18 45</td>
<td>4 10</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>19 47.5</td>
<td>0 0</td>
<td>16 40</td>
<td>5 12.5</td>
</tr>
<tr>
<td>8E</td>
<td>experimental</td>
<td>2 5</td>
<td>13 32.5</td>
<td>25 62.5</td>
<td>0 0</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>4 10</td>
<td>17 42.5</td>
<td>16 40</td>
<td>3 7.5</td>
</tr>
<tr>
<td>9</td>
<td>experimental</td>
<td>2 5</td>
<td>27 67.5</td>
<td>10 25</td>
<td>1 2.5</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>1 2.5</td>
<td>13 32.5</td>
<td>25 62.5</td>
<td>1 2.5</td>
</tr>
<tr>
<td>10</td>
<td>experimental</td>
<td>9 22.5</td>
<td>1 2.5</td>
<td>18 45</td>
<td>12 30</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>8 20</td>
<td>2 5</td>
<td>25 62.5</td>
<td>5 12.5</td>
</tr>
</tbody>
</table>

According to the percentage distribution in the question, If the Resolved value is greater than the Ongoing value, it is said that the misconception has been resolved for this question. However, if the ongoing value is greater than the resolved value, it was interpreted that the misconception could not be eliminated for this question. The findings obtained from these comments are tabulated and given below in Table 4.

Table 4: Elimination of misconceptions according to the answers of the groups to the MT

<table>
<thead>
<tr>
<th>eliminated misconception</th>
<th>ongoing misconception</th>
<th>eliminated misconception</th>
<th>ongoing misconception</th>
</tr>
</thead>
<tbody>
<tr>
<td>The temperature depends on the amount of substance.</td>
<td>Heat and temperature are the same concepts</td>
<td>Heat and temperature are the same concepts</td>
<td>The temperature depends on the amount of substance.</td>
</tr>
<tr>
<td>Heat can flow from one substance to another</td>
<td>Substances in the same environment have different temperatures</td>
<td>Dissolution is melting or disappearing</td>
<td>Substances in the same environment have different temperatures.</td>
</tr>
<tr>
<td>The mass of substances that receive heat also increases.</td>
<td>The temperature depends on the material the object is made of.</td>
<td>Heat can flow from one substance to another</td>
<td>The mass of substances that receive heat also increases.</td>
</tr>
<tr>
<td>Dissolution is melting or disappearing.</td>
<td></td>
<td></td>
<td>The temperature depends on the material the object is made of.</td>
</tr>
</tbody>
</table>
Looking at Table 4, it can be said that four misconceptions in the experimental group students and two misconceptions in the control group students were eliminated. Again, based on the above data, the misconceptions of the experimental group students on three subjects and the control group students on five subjects could not be eliminated.

Conclusion and suggestion

In this study, the effect of EBA supported constructivist teaching in eliminating misconceptions in science teaching was investigated. The MT prepared in line with the purpose of the study was applied to the experimental and control group students and the obtained data were examined. In the experimental group, the lessons were taught using the e-contents Morpha Campus and Okulistik in the EBA, while the lessons in the control group were taught by adhering to the guidebook and according to the activities in the guidebook. However, since the aim of this study is to eliminate the misconceptions by using the e-contents in the EBA, additional work to eliminate the misconceptions, for example, meaning analysis tables, concept cartoons, analogies, etc., which we call conceptual change strategies, was not used.

To obtain more concrete results in detecting misconceptions, the data were analysed with a cross table. Two questions were prepared for the misconception of "heat and temperature are the same concepts". In item 1, the misconceptions of the students of both groups continued. In question 9, while the misconception, "temperature occurs only in cases where there is a fire. Objects around a burning fire are heated by the heat carried by the light emitted by the fire", continued in the experimental group, it was resolved in the control group. In primary school 5th grade students [17], high school students [18], and teacher candidates [19] the same misconception was found. [20] eliminated the misconception that "heat and temperature are the same concepts" with the 5E learning model. In this study, however, it was observed that the misconception of the experimental group students could not be resolved.

A question was prepared for the misconception of "heat does not depend on the amount of substance, temperature depends on the amount of substance". In item 2, while the misconceptions in the experimental group were resolved, it continued in the control group. This misconception was largely eliminated from eighth grade students by conceptual change method [21]. In this study, the misconception in the experimental group was eliminated to a large extent with EBA materials.

Two questions were prepared for the misconception of "heat can flow from one substance to another". While the misconception of experimental group was eliminated in item 3, the misconception in both groups were eliminated in the question number 10. This misconception was largely eliminated from seventh graders by conceptual change method [22]. In this study, it can be said that this misconception could not be eliminated.

Two questions were prepared for the misconception of "the temperatures of substances in the same environment are different". In items 4 and 5, the misconceptions of experimental and control groups could not be eliminated. On the other hand, it was largely eliminated by conceptual change method [22]. In this study, it was observed that the misconception in the experimental group students continued.

A question was prepared for the misconception of "the mass of substances that receive heat also increases". While the misconception of experimental group was eliminated in item 6, the misconception in the control group continues. Moreover, 5th grade Turkish students think that the mass of the substance receiving heat changes [17] [23]. In this study, a misconception that existed in the experimental group students was largely eliminated.

A question was prepared for the misconception of "temperature depends on the material of which the object is made". In item 7, the misconception of experimental and control groups could not be eliminated. [24] found the same misconceptions. [25] conducted his study to eliminate the misconception. Because of his work, this misconception has been largely corrected.

Five questions were prepared for the misconception of "seeing dissolution as melting or disappearing". In items 8A, 8B, 8D and 8E, the misconceptions of experimental group were eliminated, and the misconceptions of experimental group could not be eliminated in the question number 8C. In the control group students, while the misconceptions in questions 8A, 8B and 8D were resolved, the misconceptions in questions 8C and 8E could not be eliminated. [26] conducted their study to identify and eliminate misconceptions. They largely eliminated this misconception. In this study, this misconception in the experimental group students was largely corrected.
Ontologically, heat is related to a process and temperature is related to physical property of matter [27]. However, high school and university textbooks use a language that can cause alternative ideas and be incompatible with the concepts representing scientific knowledge [27]. To help students in differentiating between heat-temperature concepts, [18] suggests teaching of the matter state change with the help of computer-assisted graphic designer program and laboratory method at high school. [28] similarly recommends using experiments and drawing of time-temperature graphs for pre-service teachers. In detail, he asks students to predict about water-heating curve for a beaker of water on an open hot plate and water-cooling curve for a test tube of water placed in a beaker of salt-ice mixture on an open hot plate. He then makes explanations about heat, energy and temperature and let his students to perform the first experiment and record the temperature, graph the findings. The students revisit the concepts and perform the second experiment. To help students in the misconception of “heat can flow from one substance to another” or learning heat transfer, [29] proposes predict-share-observe-explain (PSOE) sequence for 5-8 graders. He gets students’ predictions about is two half-full beakers of water at different temperatures are mixed. After the experiment, students can find out the last temperature as the average of those mixtures, and the direction of heat transfer from hot to cold.

Web-Based Inquiry Science Environment (WISE), such as PHET can be used to include students’ knowledge integration in heat-temperature, melting-dissolving concepts. Knowledge Integration (KI) is a framework for integrating inquiry in science lessons. For heat and temperature topic, a possible KI should be on differentiation between heat and temperature, or temperature and sensation of an object. After using this technology, students’ improvement in these gains can be compared and if necessary, scaffolding can be provided by the teacher [30].

The effect of e-contents in EBA in eliminating misconceptions at primary school level was investigated in this study. EBA resolved some of the misconceptions about heat-temperature and melting-dissolution. In the control group, the constructivist approach worked in accordance with the guidebook. The continuation of misconceptions despite the warnings may be an indication that the course teachers do not consider these warnings. The difference of this study from other studies is that it was made with e-contents in EBA. In this regard, the power of e-contents in eliminating misconceptions can be increased by studying misconceptions on different subjects and with different sample groups. There are many studies on misconceptions in the literature. However, the scarcity of studies at primary school level draws attention. Considering that science teaching/learning is a lifelong process, more studies should be done at primary school level. [31] emphasized that if no precaution is taken these misconceptions continue in the upper classes as well. In this study, the researcher taught the experimental group lessons, and the teacher of that class taught the control group lessons. These lessons should be taught by practitioners to minimize the errors caused by the practitioner in scientific research.

Teachers do not have enough knowledge about EBA and not all of them use it and if they use it their lesson become enjoyable [32] [33]. Turkish science curriculum has been prepared in accordance with the constructivist approach. Students' previous knowledge, beliefs and thoughts have an impact on acquiring new behaviours based on this approach [34]. Learning is the construction of meanings in the mind of the student. It is important for the student to participate in the process knowing their responsibilities and the relationships to be established between learning. In terms of computers, multiple interactions in the learning-teaching process and the role of the teacher in this process are given importance. Student participation in the learning process is an important part of constructivism. Ensuring participation occurs through mutual interaction. Therefore, it should be determined how this interaction will be achieved. Interactive applications develop scientific thinking; with the discussions to be held, ideas are shared, and new ideas are obtained. These features make the computer an important tool for configuring information [34]. In other words, CAI is a tool that should be used in the constructivist approach. According to the definition of [34], we can describe Morpha Campus and Okulistik e-contents as ready-made package programs. People from different fields of expertise (teacher, instructional designer, computer specialist, etc.) create ready-made package programs by considering a certain student level. Their usefulness is also debatable because each student in terms of entry characteristics, especially computer literacy and prior knowledge differs [34]. In this study, the reason why EBA supported constructivist approach did not influence eliminating students’ misconceptions may be since e-contents were prepared without considering students' input characteristics such as computer literacy and subject knowledge.

Since the first researcher taught the experimental group, the students, who were disturbed by this situation while doing classroom activities and teaching, expressed to the researcher that they were uncomfortable with this situation. This situation negatively may have affected the success of some students.
Therefore, the studies to be conducted with younger age groups should be carried out without changing the teacher and environment. Although there were 96 students in the sample, the data of 77 students were used in the study. 19 students had to be excluded from the study because they were not present at pre- or post-tests. In studies that may take a long time, the large number of students in the sample may be an advantage for researchers against negative situations that may occur. The MT has two stages, and in the second stage, the student was asked to express their own thoughts. Since the sentences in which the students expressed themselves were not written very well, it was difficult to read. Therefore, it was very difficult to understand what the students wanted to express. Different test styles can be prepared for studies to be carried out at primary school level.

The e-contents in the EBA should be enriched considering that not every student has the same entry qualifications. Moreover, useless e-content should be removed from it. Knowledge and experience about how teachers can use CAI for the effective learning of their students should be provided through pre-service and in-service training [34]. Although sufficient maturity has been reached in the production, dissemination and use of chemistry videos, a brilliant level has not yet been reached in integrating them into the curriculum [35]. Therefore, how these videos can be used effectively and efficiently in teaching environments should be investigated because teaching methods and strategies and learning styles should change. According to [8], CAI should be used together with appropriate teaching methods. Teacher guidebooks should include activities to eliminate misconceptions. Conceptual change texts should be prepared in accordance with strategies such as concept cartoons and analogy since the concept wheel will not be suitable for the level of students.

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Влияние обучения с помощью образовательной информационной сети (EBA) на представления учащихся о температуре нагрева и плавления - растворении

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В этом исследовании ставилась задача определить, устраняет ли компьютерное обучение неправильные представления учащихся четвертого класса о температуре нагрева и плавления - растворении. Исследование было разработано в соответствии с планом экспериментальной группы до и после тестирования. Генеральную совокупность составили учащиеся четвертого класса начальной школы г. Нигде, Турция, в 2014-2015 учебном году. Выборка составила 96 учащихся, которые посещали три начальные школы в районе Эсилгольчук в Нигде. Исследование заняло в общей сложности 12 часов в течение четырех недель. Исследователь использовал видеоролики и анимацию Morpha Campus и электронный контент Okulistic в Образовательной информационной сети (EBA) для обучения школьников экспериментальной группы с помощью компьютерного обучения. Тест на неверное представление проводился с учениками как экспериментальной, так и контрольной групп. Данные были проанализированы с помощью t-теста и перекрестной таблицы. Для анализа данных использовалось программное обеспечение SPSS Statistics 22. В результате, Morpha Campus и электронный контент Okulistic в EBA устранили больше заблуждений студентов экспериментальной группы. Кроме того, исходящие заблуждения также были уменьшены при обучении с помощью Образовательной информационной сети (EBA).
Ключевые слова: заблуждение, компьютерное обучение (CAI), образовательная информационная сеть (EBA), наука и техника, учащиеся начальных классов

EVA комегімен оқытуында студенттердің температура мен балқу-еру туралы идеяларына есері

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Бұл зерттеде балқу-еру және жоғары температурада қыздыру туралы төртінші сынып оқушыларының жылдыққа оқыту әдісін қолдану әсерін анықтайды. Зерттеу әдісіне студенттердің білім беру көмекшілігін,шатасу үшін Morpha Campus видеоролигі мен анимациясы және Білім беру ақпараттық желісіндегі Okulistic электронды контентін пайдаланған. Зерттеу әдісін 12 сағатқа түсіндіреді.

Түйін сөз: шатасу (адасу), компьютерлік оқыту (CAI), білім беру ақпараттық желісі (EBA), ғылым және техника, бастауыш сынып оқушылары

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Редакцияға түсті / Поступила в редакцию / Received 09.12.2021
Жариялауға қабылданды / Принята к публикации / Accepted 28.12.2021