

USING TECHNOLOGY IN SCIENCE EDUCATION: A COURSEWARE TO OVERCOME MISCONCEPTIONS AND LEARNING DIFFICULTIES ABOUT PHOTOSYNTHESIS

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ABSTRACT

Photosynthesis is one of the abstract subjects in biology. A lot of students have some learning difficulties because of lack of the laboratory studies. CBI provides to the students an imaginary world and the students have some possibilities which they cannot have in a traditional learning environment such as immediate feedbacks, flexible study hours, and chance of study again and again in this imaginary world. Also the students have had some misconceptions about the photosynthesis because of their previous experiences. The students need to test and see the results in order to change the concepts in their mind. CBI provides an appropriate study environment for students to observe their right and wrong behaviors on their study. In this study a courseware was designed which supports the students to overcome the misconceptions and learning difficulties about the photosynthesis by presenting an interactive learning environment which represents the real life to the students' manipulations. The sample group is consisted of 21 6th grade students. The students can study on the subject at this micro world and create a connection between the abstract concepts and the real life. The students was conducted a pre-test at the beginning of the class and then they studied with this courseware. After their study they take a post-test. Their accomplishment was measured by using these tests and the students and the teacher had a usability test to determine the courseware usability.

Key words: Computer Based Instruction, misconception, learning difficulty

INTRODUCTION

Photosynthesis is one of the abstract subjects in biology. A lot of students have some learning difficulties because of lack of the laboratory studies. CBI provides to the students an imaginary world and the students have some possibilities which they cannot have in a traditional learning environment such as immediate feedbacks, flexible study hours, and chance of study again and again in this imaginary world. This courseware supports the students to overcome the learning difficulties about the photosynthesis by presenting an interactive learning environment which represents the real life to the students' manipulation. The students can study on the subject at this micro world and create a connection between the abstract concepts and the real life.

The students have had some misconceptions about the photosynthesis because of their previous experiences. For instance some of the students in elementary schools have some misconceptions about the functions of the green leaves of plants, the functions of the soil or the gas circulation between living organisms. it is very difficult to terminate the misconceptions which students bring from their lives. The students need to test and see the results in order to change the concepts in their mind. CBI provides an appropriate study environment for students to observe their right and wrong behaviors on their study. After observation of studying with different variables, the students can easily correct their misconception on their mind.

This courseware aims to determine how this interactive learning environment which is prepared by using multimedia with some pictures, graphics, sounds, animations, and simulations in a proper story from real life affects the 6th grade students to overcome their learning difficulties and to correct their misconceptions about the photosynthesis.

The students begin to their education with personal experiences, ideas, and beliefs about the science concepts. Mostly the knowledge of the students which they have as a result of their own experiences is far from the scientific and they are called misconceptions. The photosynthesis which has an important function for understanding the matter circles in nature is one of the subjects which the students have a lot of misconceptions (Köse, Ayaş, Karamustafaoğlu, and Coştu, 2001).

Şensoy, Aydoğdu, Yıldırım, Uşak, and Hançer (2005) point out the misconceptions about the Photosynthesis;

- The students have a misconception about the source of nutrition for plants and the function of the soil in the process of photosynthesis.
- The students have a misconception about the circle of oxygen-carbon dioxide and the dependence between the living organisms.
- The students confuse the function of the leaves of green plants in photosynthesis.
- The students have some difficulties to define the gas which is formed by green plants in photosynthesis.
- The students have a misconception about the effects of the light on photosynthesis and definition the productions of the photosynthesis reaction.

According to the researches some of the reasons for the misconceptions of the students can be defined like below:

- Photosynthesis as a subject in science curriculum is one of the abstract subjects and difficult to understand (Eisen and Stavy, 1992).
- The learning units are very similar to each other and the students have difficulty to make connections between the learning units (Tekkaya and Balçı, 2003).
- The students have difficulty to establish a relationship between the content and real life (Tekkaya and Balçı, 2003).
- The inadequate time for laboratory hours for experiences and observations (Köse et al., 2001).

it is supposed that in learning environment single representation style such as text or picture can be inadequate, different representation styles should be used together (Akpınar, 1995, Orr et al., 1997, Stemler, 1997). The visual representations can need to support with textual, verbal or basic symbolic representations (Merrill, 1990). in computer based instruction the content can be demonstrated with different representation styles via multimedia. Therefore to make concrete the abstract concepts are easier in computer based instruction than traditional learning environment for the students.

The human brain operates on essence of stories and the importance of stories on human life is directly related with education (Schank, 1995). The courseware in computer based instruction is developed on a story from real life and the leading role belongs to the students. A micro world which the story exists in is designed for the students to study on. Therefore the students have an opportunity to make connections between the content and real life.

The micro worlds and stories are also important for motivation issues. The students have the responsibility and control of the learning during their own learning process (Akpınar, 2005). According to Malone (1981), one of the components of motivation is Fantasy. The student should have a position in the story and to perform according to his/her role. Therefore the students are enhanced to intentionally use their knowledge.

According to Köse and his colleagues (2001), some of the teachers explain inadequate laboratory activity, inadequate time for this experiments, and inadequate laboratory equipment. it is a problematic issue for each field in science. However, computer based instruction can be a solution for this problem. The computer based instruction presents an imaginary laboratory environment for science education. The experiments can be simulated and the laboratory studies can be increased in science courses in this way. Moreover in this imaginary laboratory the students can test the subject again and again with different parameters and get immediate feedback about their different efforts.

Science courses is very convenient to apply computer based instruction because the scientific concepts and principles are very much in these courses and these scientific concepts and principles transfer to the students as visual and auditory by using appropriate teaching methods (Demircioğlu ve Geban, 1996; Ayaş ve diğ., 2001).

There is a common understanding that computer based simulations involve the dynamic representations of process, incorporating to varying degrees the possibility of intervention, generally referred to as “interactivity” on the part of the user (Dowling, 1997).

This interactivity is provided via simulations. Simulations imitate the reality like animations but it also enhance to students in order to examine the variables with different parameters and conditions. The students have a possibility to examine some contents which are dangerous, time consumer or impossible in real life thanks to simulations. The simulations also decrease the costs for some experiences. Simulations have an importance in aspect of student’s manipulation. Student’s manipulation provides to the students the idea of to be dominant in the system and the idea of responsible to their own learning process (Hannafin, 1984).

This courseware is a type of computer based instruction and it helps to the students in order to make concrete the abstract concepts easier than traditional learning environment. The subject is presented in a story and it begins with a challenge for the students. The courseware is designed on the base of students’ manipulation. Therefore the students’ motivation is supplied and the students have the responsibility of their learning process.

Evaluation studies were carried out to examine whether the “Fotosentez Serasi” could achieve the objectives of the learning unit, overcome learning difficulties and misconceptions successfully, and whether it helps students to learn the subject matter.

Hypothesis

Null Hypothesis

1. There is not any significant difference between pretest and posttest scores of the 6* grade students, studied photosynthesis with the “Fotosentez Serasi”, at the 0.05 level.
2. There is not any significant difference between pretest-to-posttest gains of female and male 6th grade students studied photosynthesis with the “Fotosentez Serasi”, at the 0.05 level.
3. There is not any significant difference between pretest-to-posttest gains of two student groups, who found the help menu is understandable in the “Fotosentez Serasi” who did not find the help menu is understandable in “Fotosentez Serasi”, at the level of 0.05.
4. There is not any significant difference between pretest-to-posttest gains of two student groups, who found the feedbacks are sufficient in the “Fotosentez Serasi” who found the feedbacks are insufficient in “Fotosentez Serasi”, at the level of 0.05.
5. There is not any significant difference between pretest-to-posttest gains of two student groups, who found colors of the object are consistent with the real life in the “Fotosentez Serasi” who did not find colors of the object are consistent with the real life in “Fotosentez Serasi”, at the level of 0.05.

Alternative Hypothesis

1. There is a significant difference between pretest and posttest scores of the 6* grade students, studied photosynthesis with the “Fotosentez Serasi”, at the 0.05 level.
2. There is a significant difference between pretest-to-posttest gains of female and male 6* grade students studied photosynthesis with the “Fotosentez Serasi”, at the 0.05 level.
3. There is a significant difference between pretest-to-posttest gains of two student groups, who found the help menu is understandable in the “Fotosentez Serasi” who did not find the help menu is understandable in “Fotosentez Serasi”, at the level of 0.05.

4. There is a significant difference between pretest-to-posttest gains of two student groups, who found the feedbacks are sufficient in the “Fotosentez Serasi” who found the feedbacks are insufficient in “Fotosentez Serasi”, at the level of 0.05.

5. There is a significant difference between pretest-to-posttest gains of two student groups, who found colors of the object are consistent with the real life in the “Fotosentez Serasi” who did not find colors of the object are consistent with the real life in “Fotosentez Serasi”, at the level of 0.05.

METHODOLOGY

Population

The population of this research was sixth grade students from schools of Terakki Vakfi in İstanbul. Their ages are approximately 12-13. The school the research was exposed is a private school.

Sample

A total of 21 sixth grade primary school students were used to assess the effectiveness of the courseware. The sample group consisted of 21 students from schools of Terakki Vakfi in İstanbul. The criteria in order to select students are to be sixth grade and to have basic computer skills enough to use “Fotosentez Serasi”. All of the subjects had basic computer skills enough to use “Fotosentez Serasi”. There was 21 students in the sample group and 9 of them are male and 12 of them female. They have not studied on the subject Photosynthesis before Fotosentez Serasi”.

Procedure

The experiment was carried out in two computer laboratories. 8 of the students are in the first laboratory and 13 of them are in the second one. There are enough computers with necessary equipment and each student can study individually. Before starting the application students were given a short introduction about the research and software. After introduction the students were given the pretest. The students had ten minutes to answer ten questions in pretest.

After each students finished pre test, they directed to operate courseware. The courseware had loaded on database and the students download it on their on computers. When the students had problems about using “Fotosentez Serasi” they are offered to use help menu. If their problems continued, the problem explained by the researcher. However the students did not have a lot of problem about the usage of “Fotosentez Serasi”. The students finished their studies between fifteen and thirty minutes. The students who finished earlier waited for their friends and they were not allowed to help their friends. After all of the students finished, the posttest was applied. The students had ten minutes again in order to answer ten questions of post test. However some students finished the post test early and usability questionnaire were given to the students who finished post tests. Each of the students were applied the usability questionnaire. They had approximately 6-7 minutes to answer questionnaire.

The usability questionnaire for teachers was applied to just one science teacher whose name is Bahar Kalkanoğlu.

Data collection tools and methods

Pretest, Posttest, and Usability tests were used to collect quantitative and qualitative data in order to analyze for the research study.

Qualitative data

Qualitative data was collected by observations, conversations and usability questionnaires. Qualitative data is used to learn thoughts and feelings of users about the courseware.

Before the treatment, the science teacher examined the courseware and says her opinions about the courseware. She said firstly, the program is a bit difficult and students with low success can have difficulty to complete it. After the treatment she says that the students did not have a problem to complete it as she had expected. She said also the courseware was motivated for students; they had good time by using the program.

The students were observed during the treatment. The students had no problem during the first four activities. However, most of them had a problem by using nutrition machines. They asked some questions to researcher and they used help menu to achieve that activity. Two of the students commented it in the open ended items of the usability test which is related with to find unnecessary parts of the courseware.

The usability tests are used as data collection tool. There are two types of users; students and teachers. Therefore two types of usability tests were given to the users.

- *Usability Test for Students:* The usability test is prepared by the researcher in order to gain the thoughts and feelings of the students who used the courseware about the courseware's usability, easiness, enjoyable and consistency between graphs.
- *Usability Test for Teachers:* The usability test is prepared by the researcher in order to gain the thoughts and feelings of the teachers who used the courseware about the courseware's usability, easiness, consistency between graphs, instructiveness, and straightness of the content.

Usability Test for Students

Usability test for Students (see in Appendix A) is applied on each student in the sample group. The sample group consists of 21 students.

There are 18 likert type questions and two open ended questions about the usage of courseware in usability test for students. Items were related with the properties and usability of screen objects; text, images, buttons and facilities and flexibility of courseware; feedbacks, help menu and exit button. The first open ended question is about useful parts of the courseware students find and second is about unnecessary parts of the courseware students think. The usability test is a likert type measurement tool. There are five types of choices for each item; Definitely Agree, Agree, Neutral, Not Agree, Definitely Not Agree. The students can choose just one for each item.

Usability Test for Teachers

There are 21 questions about the courseware in the Usability Test for Teacher (see in Appendix B). Items were related with the properties and usability of screen objects; text, images, buttons and facilities and flexibility of courseware; feedbacks, help menu and exit button. In addition, there are items about the instructiveness of the courseware and the straightness of the content in usability test for teacher. These items aim to gain the teacher's opinion about the strength of the courseware. In addition to items, there are two open ended questions for teacher's opinions about the useful and unnecessary parts of the courseware.

There are five choices for each item and the teacher can select just one of them for each item. The choices are; Definitely Agree, Agree, Neutral, Not Agree, Definitely Not Agree

Quantitative data

in this research, quantitative data is collected by a pretest and a posttest.

Pretest

Pretest (see in Appendix C) is used to measure students' prior knowledge about the photosynthesis. it consists of the multiple choice questions. The students do not need any calculation to answer them; they can answer them by interpretation. Each question is value of one correct answer. The maximum score of the test is ten. 4 of ten questions have a shape or diagram. This test was prepares on the base of the test to measure the students' misconceptions about the subject in the paper of Şensoy and his colleagues (2005).

Posttest

Posttest (Appendix D) is used to measure students' comprehensions of the photosynthesis after they studied with "Fotosentez Serası". it consists of ten multiple choice questions and the questions are parallel with the questions in the pre test. in post test just one question includes a diagram. None of the questions requires calculations; the students can answer them by interpretations. The students get one point for each correct answer. The maximum score of the test is ten.

Data Collection

Data collection managed by the following procedures: Observation, Interview with teacher, Usability tests for students, Usability tests for teacher, Pretest, Posttest

The students are given information about the research and courseware at the beginning of the application. Before they started to study with the courseware, they are administrated a pretest about the subject. They had one minutes for each questions in the test and there were ten multiple choice questions in the test.

After each student finished answering pretest, they downloaded the program on their computers and started to study it. While students were studying with the courseware, their actions and reactions are observed by the researcher. The students did not have many problems by using the computers. Ali of the students have basic computer skills and there was no any technological problem. The students finished the first four activities without any problem and any question. They had some difficulties while studying the nutrition machines. They seemed motivated while using courseware. However, they always complain to answer tests.

After ali of the students completed ali activities in the courseware, they administrated post test. They had ten minutes again in order to answer post test. The students who finished post test are given usability test in order to learn their opinion about the courseware. The students had five minutes to answer usability test. The open ended questions in the usability test were used to learn students' thoughts about the courseware but the students did not have to answer them. Although most students did not give any answer, some of them prefer to answer these questions. The treatment took up about approximately 55 minutes.

The science teacher was also given a usability test for teachers and researcher interviewed with her in order to learn her opinions about the courseware.

FINDINGS

According to descriptive statistics and Histograms (see in Appendix E), while pretest results show normal distribution, posttest results do not; therefore, non-parametric tests were used in statistical analysis. Qualitative and quantitative data and the results of analysis of data showed the alternative hypothesis is accepted or rejected.

Usability of courseware

Students' Opinion

According to analysis of usability tests of the sample group 94% of the students found "Fotosentez Serasi" usable in general.

90% of the sample groups found the activities in the courseware clear and understandable and they clarified they finished the activities easily.

81-86% of the students found using of the courseware enjoyable and has no problem by using courseware, understanding the functions of the screen objects, using the help menu and they said that they read the texts easily and they said that they were able to use the buttons in the courseware easily and terminated the program when I want.

71-76% of the sample groups found the shape of the objects are consistent with their form in real life and they clarified that they were able to understand easily the texts in the courseware and reach to help menu when they need.

67% of the students found the colors of objects in the courseware are consistent with the colors of objects in real life and the feedbacks in the courseware are sufficient and beneficial.

52% of the sample groups found the help menu clear and understandable and were be able to predict sequence of screen.

12 of the 21 students (57%) answered the first open ended question. This question aims that to learn the students' opinion about the beneficial parts of the courseware. 6 students answered this question as "it helped me to understand the photosynthesis, I learned photosynthesis by using this courseware." 2 of these students clarified that "it is useful for science lesson" and 2 of them answered as "I have learned photosynthesis more enjoyable". 2 of the students wrote the animations are beneficial in the courseware.

Just four students (19%) answered the second open ended question. This question aims that to learn the students' opinion about the unnecessary parts of the courseware. 2 of the students found the nutrition producing machines are unnecessary. One student wrote "there is no need to rabbit." And last one clarified the sounds are sometimes interrupted.

Teachers' Opinion

Usability test for teachers were administrated to the science teacher of Schools of Terakki Vakfi: Mrs. Kalkanoğlu. Mrs. Kalkanoğlu answered the test are using the courseware. She found the courseware usable in general. She found the usage of courseware are easy in general, students can use it without any need to help, the directions in the courseware are sufficient and beneficial, the colors and shapes of the objects in the courseware are consistent with the objects' in real life, the color of the buttons in the courseware are consistent and their usage are easy, the texts are understandable, the help menu clear and understandable, the information and directions in help menu are beneficial and the help menu are easily accessible. She clarified the activities in the courseware are understandable, enjoyable, enough for students, the feedbacks are clear and understandable and in right time. Mrs. Kalkanoğlu had no opinion about the readiness of the texts, appropriateness of the courseware to level of the students and students can learn photosynthesis from this courseware.

Learning (post-pre test difference, statistical analysis)**Differences Between Pretest and Posttest Scores**

in order to analyze the differences between pretest and posttest scores and correlation, *2 Related Samples Test* (See in Appendix F) was used.

$N = 21$

$df = N-1 = 20$

According to *2 Related Samples Test* analysis results, pretest scores of the sample group ($M=4,82$, $SD=2,42$) is significantly higher than posttest scores ($M=7,69$, $SD=3,04$): **$p=.002$, two tails.**

Z score is $-3,110a$.

Therefore, null hypothesis is rejected. Two tailed significance level for 2 Related Samples test of sample group is smaller than .05 and it is highly significant. Alternative hypothesis which states “*There is a significant difference between pretest and posttest scores of the 6th grade students, studied photosynthesis with the “Fotosentez Serasi”, at the 0.05 level.*” is accepted. Wilcoxon Signed Ranks test was used to analyze the data.

Differences Between Female and Male Students’ Pretest and Posttest Mean Scores

2 Independent Sample Test (see in Appendix G) was used, in order to analyze the differences between pretest-to-posttest gains related to gender.

$N_1=12$, $N_2=9$ $df = N_1 + N_2 - 2 = 19$ **$p=.539951$** for pretest; **$p=.338362$** for post test Z score is $-.612888$ for pretest, Z score is $-.957407$ for posttest.

According to 2 Independent Sample Test analysis results, null hypothesis which states “*There is not any significant difference between pretest-to-posttest gains of female and male 6th grade students studied photosynthesis with the “Fotosentez Serasi”, at the .05 level*” is retained. Mann-Whitney test was used to analyze the data.

Differences between Pretest-to-Posttest Gains Related to Usability Perceptions**Differences between Pretest-to-Posttest Gains Related to Perceptions of understandability of help menu.**

in order to analyze the differences between pretest-to-posttest gains related to perceptions of understandability of help menu, subjects were separated into two groups. The subjects who found understandable the help menu were collected into one group (10 students), and the subjects who didn’t find understandable the help menu were collected into another group (11 students). If usability item 10 score >3 -> agree If usability item 10 score <3 -> disagree 2 Independent Sample Test (see in Appendix H) was used in order to compare these two groups according to their pretest-to-posttest gains.

$N_1=10$, $N_2=11$

$df = N_1 + N_2 - 2 = 19$

$p = .476$

Z score is $-.713031$

According to 2 Independent Sample Test analysis results, null hypothesis which states “*There is not any significant difference between pretest-to-posttest gains of two student groups, who found the help menu is understandable in the “Fotosentez Serasi” who did not find the help menu is understandable in “Fotosentez Serasi”, at the level of 0.05.*” is retained. Mann-Whitney test was used to analyze the data.

Differences between Pretest-to-Posttest Gains Related to Perceptions of sufficiency of feedbacks.

in order to analyze the differences between pretest-to-posttest gains related to perceptions of sufficiency of feedbacks, subjects were separated into two groups. The subjects who found feedbacks sufficient were collected into one group (14 students), and the subjects who found feedbacks insufficient were collected into another group (7 students).

While comparing these two groups according to their pretest-to-posttest gains, *2 Independent Sample Test* (see in Appendix I) was used.

$$N_1=7, N_2=14 \quad df = N_1 + N_2 - 2 = 19 \quad p = .064199 \quad Z \text{ score is } -1.850792$$

According to 2 Independent Sample Test analysis results, null hypothesis which states “*There is not any significant difference between pretest-to-posttest gains of two student groups, who found the feedbacks are sufficient in the “Fotosentez Serasi” who found the feedbacks are insufficient in “Fotosentez Serasi”, at the level of .05. ”* is retained. Because two tailed significance level for independent samples test of sample group is pretty larger than .05, we can say it is highly insignificant. Mann-Whitney test was used to analyze the data.

Differences between Pretest-to-Posttest Gains Related to Perceptions of consistency of objects’ color.

in order to analyze the differences between pretest-to-posttest gains related to perceptions of consistency of objects’ color, subjects were separated into two groups. The subjects who found colors of objects consistent with the colors of objects in real life were collected into one group (14 students), and the subjects who found colors of objects inconsistent with the colors of objects in real life were collected into another group (7 students).

While comparing these two groups according to their pretest-to-posttest gains, *2 independent Sample Test* (see in Appendix I) was used.

$$N_1=7, N_2=14 \quad df = N_1 + N_2 - 2 = 19 \quad p = .113 \quad Z \text{ score is } -1.586$$

According to 2 independent Sample Test analysis results, null hypothesis which states “*There is not any significant difference between pretest-to-posttest gains of two student groups, who found colors of the object are consistent with the real life in the “Fotosentez Serasi”, who did not find colors of the object are consistent with the real life in “Fotosentez Serasi”, at the level of 0.05. ”* is retained. Because two tailed significance level for independent samples test of sample group is pretty larger than .05, we can say it is highly insignificant. Mann-Whitney test was used to analyze the data.

CONCLUSION

The aim of the study is to determine whether there was a significant effect of “Fotosentez Serasi” in order to cope with 6* grade students’ misconceptions and learning difficulties about the subject; photosynthesis. This study was conducted also to test the effectiveness of “Fotosentez Serasi” to teach the subject with a new way. Our analysis showed that there is a significant difference between pretest and post test results. Therefore, we can say there is a positive correlation between students’ learning gain and using “Fotosentez Serasi”.

This study also showed that there is no direction effect of gender, understandability of help menu, sufficiency of feedbacks, and consistency of objects’ color with real colors on students’ achievement in subject, photosynthesis.

The results obtain from collected data are listed below;

- “There is a significant difference between pretest and posttest scores of the 6th grade students, studied photosynthesis with the “Fotosentez Serası”, at the 0.05 level. ”
- “There is not any significant difference between pretest-to-posttest gains of female and male 6th grade students studied photosynthesis with the “Fotosentez Serası”, at the 0.05 level”
- “There is not any significant difference between pretest-to-posttest gains of two student groups, who found the help menu is understandable in the “Fotosentez Serası” who did not find the help menu is understandable in “Fotosentez Serası”, at the level of 0.05. ”
- “There is not any significant difference between pretest-to-posttest gains of two student groups, who found the feedbacks are sufficient in the “Fotosentez Serası” who found the feedbacks are insufficient in “Fotosentez Serası”, at the level of 0.05. ”
- “There is not any significant difference between pretest-to-posttest gains of two student groups, who found colors of the object are consistent with the real life in the “Fotosentez Serası”, who did not find colors of the object are consistent with the real life in “Fotosentez Serası”, at the level of 0.05.

According to researcher observations, students had difficulties mostly in nutrition producing activity. There are two different types of machines and molecules in limited number. If they put some of the molecules in one machine and put the lefts in the machine, they do not understand why any change did not occur. Most of the students need and use help menu for this activity. They seem enjoying while studying with “Fotosentez Serası”. They also clarified their pleasure from using the courseware.

Limitations of the Study

This treatment is limited because of limited size of population. The sample group consisted of 21 6th grade students. The study implemented on just one class of a one school. Therefore it is not true to generalize it to all students. The type of school is another limitation. Because the school experiment was conducted in a private school and most of the students took support courses, they can be more successfully than the students in public schools.

Recommendations for future software development

This study researched the effects of “Fotosentez Serası” on the achievement of 6th grade students on the subject photosynthesis. For future software development there are some recommendations are; The subject photosynthesis is subject in the unit Cycle of Matter’s Energy. This courseware can be a small part of a unit. Whole unit can be prepared as computer based learning and this courseware can be integrated to the whole unit.

New activities can be prepared according to difficulties. There can be an option about difficulty level for students or the courseware can a decision mechanism in order to direct students to different activities according to their correct or wrong answers.

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