

A CONTEXTUALIZED NATURE OF SCIENCE CLASSROOM ACTIVITY: JUNK FOOD!¹

Ferah Özer², Nihal Doğan³, Gültekin Çakmakçı⁴, Serhat İrez⁵, Yalçın Yalaki⁶

ABSTRACT

In the current study, contextualized and explicit-reflective approach enriched, content specific nature of science activities were developed during a teacher professional development project. Developed activities were implemented by teachers and restructured via the feedback received during the professional development sessions and online platforms. After the reconstruction of the activities, they were made available for use by science teachers. In this study, it was aimed to provide information about the development process and application examples of one of the activities developed for 7th graders, which can also be used with 5th graders. To this end, it was emphasized how important it is to create awareness among students about obesity, which is one of the most important health problems of our time. Moreover, it was recommended for teachers to make their own decisions and to have an auto-control mechanism in the process of classroom activity development and implementation.

Keywords: nature of science (NOS), contextualized activities, obesity, balanced-healthy diet.

BİLİMİN DOĞASI İÇERİK TEMELLİ ETKİNLİK ÖRNEĞİ: ABUR CUBUR!

ÖZ

Bilim okuryazarlığının önemli bir boyutu olan bilimin doğası ile ilgili jenerik etkinliklere literatürde sıkça rastlanmasına rağmen, öğrencilere bilimin doğası ve ünite kazanımlarının birlikte kavratılmasına imkan sunan etkinlikler oldukça sınırlıdır. Bu nedenle düzenlenen bir öğretmen mesleki gelişim projesi kapsamında, içeriğe özgü, bilimin doğasının ünite kazanımlarına entegre edildiği, doğrudan yansıtıcı yaklaşım temelli etkinlikler geliştirilmiştir. Geliştirilen etkinlikler öğretmenler tarafından uygulanmış, alınan dönütlere göre yeniden yapılandırılmıştır. Bu çalışmada, 7.sınıflara yönelik olarak geliştirilen, aynı zamanda 5.sınıflara da uygulanabilen, etkinliklerden birinin geliştirilme süreci ve uygulama örnekleri hakkında bilgi verilmesi amaçlanmıştır. Bu amaç doğrultusunda, günümüzün en önemli sağlık sorunlarından birisi olan obezite ile ilgili bilimin doğası temaları çerçevesinde öğrencilerde nasıl bir farkındalık oluşturulacağı vurgulanmıştır. Ayrıca etkinlik geliştirme ve sınıf içi uygulamalarında öğretmenlerin, kendi kararlarını verebilmesi ve otokontrol mekanizmasına sahip olmaları önerilmektedir.

Anahtar kelimeler: bilimin doğası, içerik temelli etkinlik, obezite, dengeli-sağlıklı beslenme.

Article Information:

Submitted: 03.08.2017

Accepted: 06.30.2017

Online Published: 10.29.2017

¹ This study was supported by the TUBITAK under the grant number 111K527.

² Research Assistant, Bogazici University, Faculty of Education, Department of Mathematics and Science Education, ferah.ozer@boun.edu.tr, ORCID: <http://orcid.org/0000-0001-8621-3522>

³ Assoc. Prof. Dr., Abant İzzet Baysal University, Faculty of Education, Department of Mathematics and Science Education, nihaldogan17@gmail.com, ORCID: <http://orcid.org/0000-0003-2225-0812>

⁴ Assoc. Prof. Dr., Hacettepe University, Faculty of Education, Department of Mathematics and Science Education, gultekincakmakci@gmail.com, ORCID: <http://orcid.org/0000-0003-2003-2520>

⁵ Prof. Dr., Marmara University, Atatürk Faculty of Education, Department of Mathematics and Science Education, sirez@marmara.edu.tr, ORCID: <http://orcid.org/0000-0003-3294-4666>

⁶ Assoc. Prof. Dr., Hacettepe University, Faculty of Education, Department of Mathematics and Science Education, yyalaki@hacettepe.edu.tr, ORCID: <http://orcid.org/0000-0003-0939-4766>

INTRODUCTION

In order to solve the economic, social, and environmental problems of the 21st century, it is very crucial for societies to have scientifically literate individuals (Eisenhart, Finkel, & Marion, 1996). Scientific literacy is expressed, in its most general definition, as an awareness of the complex relationships between the concepts of science, society, and technology and the concepts of individuals about scientific processes, theories, laws, and concepts (Abd-El-Khalick, Bell, & Lederman, 1997). The national science curriculum that the Ministry of National Education [MoNE] put into practice in 2005 and 2013 has a vision of educating all students as scientific literate individuals regardless of their individual differences (MoNE, 2005, 2013). Osborne (2002) defined a scientifically literate individual as a person who is aware of the importance of evidence that distinguishes scientific knowledge from opinion and other information, with the help of current scientific, social, and historical examples and who should have empathy about how scientific information is produced and how social, cultural and historical processes influence this process. Many science education researchers have pointed out that the concept of nature of science [NOS] plays a key role in the education of scientifically literate individuals (Boujaoude, 1995; Dogan, 2011; Lederman 1992) and that the inclusion of NOS concepts into the science teaching processes is an absolute necessity in the education of scientifically literate individuals (İrez & Turgut, 2008).

Studies show that the integration of NOS concepts with science concepts and subject matter knowledge enhances students' learning in this area (Lederman, 2006). However, in some studies, it was reported that the vast majority of teachers had difficulties to integrate the NOS concepts into science subjects in the curriculum (Abd-El-Khalick & Akerson, 2004; Akerson, Morrison, & McDuffie, 2006). Another factor that makes it difficult for teachers to integrate the NOS concepts into science standards is the lack of *contextualized* NOS activities in textbooks, which is one of the easily accessible resources for students (Esmer, 2011; İrez, 2008; Özden & Cavazoğlu, 2015). On the other hand, it has

been emphasized in many studies that contextualized NOS activities help teachers to integrate NOS themes into classroom practices (Khishfe & Lederman, 2006). However, there are a limited number of examples/activities in the literature to guide teachers on this issue (Brickhouse, Dagher, Letts, & Shipman, 2000; Schwartz, 2009).

Therefore, in the present study, in the context of a long-term professional development program project for science teachers (for more details, see <http://www.bilimindogasi.hacettepe.edu.tr/english.html>), it was aimed to introduce contextualized NOS teaching materials in terms of the development process and application instances that are specific to the content and compatible with the existing curriculum because only limited number of NOS integrated classroom activities can be found in the literature. This activity emphasizes the social and cultural effects in the development of scientific knowledge and it aims to raise students' awareness of obesity and balanced nutrition, which is one of the most important health problems of our time.

Teacher Professional Development

The activity, introduced in the current study, was developed within the context of a professional development program that was organized by a project team of 12 members affiliated to three universities, and lasted for 30 months between 2013 and 2015. The participants of the long-term professional development program were 39 science teachers working in different cities of Turkey. In the project, contextualized activities that integrated NOS themes into the subject matter knowledge were developed for use in classroom practices for a year, and a total of 10 workshops were provided with the NOS sessions in a continuous discussion-reflection environment. These activities were implemented by the teachers during one academic year and they were restructured according to the difficulties, feedbacks, advantages, and disadvantages encountered by the teachers. Final versions were presented in e-book format free of charge for use by all science teachers in Turkey (for more details, see Yalaki, 2016).

In addition, an online support system (moodle) was created to remotely communicate and support teachers about classroom practices of the activities developed under the project. With the moodle system created, teachers were asked to share their evaluations of the activity and the products related to the activity with the project team. An assessment scale (rubric) was also prepared for the evaluation of all the activities after they were applied by the teachers and they were asked to complete after the activity (see Appendix 1).

Why Obesity?

Obesity is defined as a chronic disease in which the energy taken up by the body exceeds the energy consumed, resulting in an increase in the body fat mass in comparison to lean body mass (Ministry of Health, 2015). In Turkey, there has been a significant increase in cases of obesity in recent years. According to the statistics of the Turkish Statistical Institute [TUIK], the obesity rate was 15.2% in 2008, and it increased to 19.9% in 2014, meaning an overall increase of 4.7% over six years. The rate of increase was 32.3% for women and 24% for men (TUIK, 2015). Over the past two decades, obesity has been reported to be a major problem not only in the developed countries but also in the developing countries (cited by Uskun, Öztürk, Kişioğlu, Kırbıyık, & Demirel, 2005, p.20). In addition, Turkey ranks thirteenth (22.3%) among the Organisation for Economic Co-operation and Development [OECD] countries with the highest obesity rates after the United States (38.2%) and Mexico (32.4%) (OECD, 2017). The incidence of obesity, especially in younger individuals, is worrying on a worldwide scale.

One of the most important reasons for the rapid increase in obesity among school children is the acquisition of unbalanced and unhealthy eating habits in the school environment. Many school cafeterias sell junk food, that is food which is prepackaged, uncooked, or low-nutritionally high-calorie foods and beverage. Consumption of these types of food cause young adolescents to develop diseases such as obesity at an early age.

The Ministry of Health and the Ministry of National Education have conducted individual and cooperative studies and policies that aim to

increase the awareness of students to combat obesity and promote healthy, balanced nutrition. The most important of these efforts is the "*Healthy Nutrition and Active Life Program of Turkey*" published by the Ministry of Health in the Official Gazette dated September 29, 2010 and numbered 27714 issued by the Prime Ministry Circular with the title "*Sufficient and Balanced Nutrition and Regular Physical Activity in the Struggle with Obesity in Schools*" and the strategy "*Implementation of Nutrition Programs for the Promotion of the Consumption of Nutrients in the Basic Nutritious Groups and Ensuring the Periodic Control of the Nutritional Services*" in order to ensure adequate and balanced nutrition during the adolescence period (Turkish Public Health Authority, 2015). In line with this action plan, the Ministry of National Education and the Ministries of Health "School Health" Projects such as the School Milk Project, Dry Grape Distribution to Schools, White Flag Schools, prohibition of the sale of fast food types of food and beverages in school canteens can be listed as examples.

However, projects and practices related to preventing obesity are mostly limited to extracurricular policies, supervision, and actions; there is not sufficient emphasis on obesity in Middle School Science Teaching Programs (MoNE, 2005, 2013, 2017). In fact, this is supported by the opinions of teachers in a national qualitative research conducted in 2015. As a result of the study, it was found that the teachers generally had sufficient knowledge about the concept of obesity and they were making correct inferences about the causes and consequences. However, it was revealed that obesity and preventing obesity were not taught in the schools, and that students were not given individual guidance on this subject (Doğan, Uğurlu, & Çetinkaya, 2015).

Healthy generations can be raised with healthy food choices and preferences. Selection of healthy foods might be possible through qualified nutrition training. Nutrition education is a great necessity for individuals at every stage of formal education and for teachers who will train them. The fight against obesity also requires the involvement of all stakeholders and an organized plan-implementation process. When considered in this context, it is very

important for the students to establish a balanced and healthy diet and an awareness about obesity through different applications integrated in the curriculum in order to educate science literate and healthy individuals.

ACTIVITY IMPLEMENTATION

Junk Food! Activity

This activity was developed with the purpose of teaching NOS, and was designed to be integrated under the 7th grade unit *Systems*, the topic 7.1.1. *Digestive system*, and the standard "7.1.1.4. *S/he discusses what needs to be done to protect the health of the digestive system based on research data*" (MoNE, 2013, p.30). However, when the spiral structure of the curriculum is taken into consideration, the same activity can also be used with 5th graders under the unit 5.1.1. *Digestion of food*, and the standard "5.1.1.4. *S/he examines and presents the effects of balanced nutrition on human health*" (MoNE, 2013, p.15) as well as with 4th graders in relation to the standard "F. 4.2.1.4. *S/he relates human health with balanced diet*" (MoNE, 2017, p.21). Moreover, it can be said that targeting 5th grade level students for healthy and balanced nutrition habits may be more suitable given that eating habits are mostly shaped in younger ages. The name of the activity was determined as "*Junk Food!*" based on the factors such as interest in the subject, suitability with the students' daily jargon, and being remarkable. It was also aimed to increase the students' awareness about this topic.

Junk Food! activity was implemented by three teachers who were working in the Central Anatolian, Mediterranean and Western Black Sea regions of Turkey during and after the project with 114 students in 6 classes. Günnür who worked in the Central Anatolia region had 31 students; consisting of Class A (n = 17) and Class B (n = 14); Deniz, who worked in the Mediterranean area had 36 students in the same class; while Filiz who worked in the Western Black Sea region had 47 students consisting of Class A (n=17), Class B (n=15), and Class C (n = 15). Teachers' names are pseudonyms.

In all of the activities developed throughout the project, in addition to subject matter knowledge, the six themes of the nature of scientific knowledge were used, depending on their appropriateness. These themes were as follows: 1) *empirical base of scientific knowledge*, 2) *tentative base of scientific knowledge*, 3) *the base of scientific models*, 4) *creativity and imagination base of scientific knowledge*, 5) *subjective base of scientific knowledge*, and 6) *the difference between inference and observation* (Özer, 2014). The *Junk Food!* Activity was developed from these themes by focusing on 4) *creativity and imagination base of scientific knowledge* and 6) *the difference between inference and observation*. In line with these objectives, different scientists should be encouraged to make different deductions with the same data and to be able to prepare different dietary programs with the same foods by transferring their knowledge from different dietary programs prepared by different scientists. It should be emphasized that imagination and creativity played an important role at every stage of the development of scientific knowledge for this activity with the subjectivity of scientific knowledge.

Materials

- Student activity handout(on which diets are included)(Appendix 2)
- Food cards (Appendix 3)
- Meal plate worksheets (Appendix 4)
- Formative assessment worksheet (Appendix 5)
- Scissors
- Envelopes

Phases of Implementation

Diet programs prepared by two scientists were included in the activity (see Diet 1 and Diet 2). Students were first asked to examine the diet programs prepared by two different specialists and to find out whether there are similarities and differences between the programs. Then, although the information about the foods was the same, the reasons for why the diets recommended by the scientists may be different were discussed in groups and as a whole class.

Diet 1. On the basis of this diet, high protein intake is essential and the consumption of meat and fish becomes unlimited on certain days, which are designated as "Protein Days." In addition, certain foods can be consumed unlimitedly during certain days during this diet. It can be said that most diets are abandoned at the beginning because of strict diet rules, thus this diet offers more flexibility and a less stressful process to its users. Thus, during this diet, the individual is stress-free and the body is taking high levels of protein. The high amount of protein entering the body plays an important role in the person's weight loss. However, one must pay attention to an important point here. Diets containing high protein should be done under the supervision of a specialist physician. The reason for this is that the high protein that can be taken in the body is likely to cause some problems due to overdose in some organs. As with most dietary types, there are difficulties with this diet. During these ten days, the individual tries to give up the eating habits he has been accustomed to for years and enters the process of adapting to the new eating habits. This adaptation process is given as ten days. If this process can be overcome steadily, it is thought that diet will make the individual healthy. This can be difficult, because the individual cannot eat other kinds of foods. The following details of all diets should not be ignored: given individual differences, it is not expected that different dietary types will produce the same effects in every individual's metabolism.

Diet 2. This diet does not aim at short-term, temporary weight loss. Individuals who have succeeded in turning this type of diet into a lifestyle first of all do not gain weight; second, they do not store fat; and finally, after a short plateau, the stored fat is broken and permanent weight loss occurs. Unlike other diets, amounts of food are never mentioned. What is important is that carbohydrates are the "absolutely forbidden" food group that should not be eaten. According to this diet, fat is not a lipid, but a carbohydrate group. When the body gets fat, it does not enter the body as a lipid. It is the combination of inactivity and carbohydrates that causes the storage of human body fat. Moreover, unlike what was previously known, this diet suggests that nuts are beneficial. Walnuts, hazelnuts, peanuts, and almonds can be consumed in abundance. The foods that need to be kept away from are bread, pastries, sugary foods, and processed foods. Fruits that are known to be rich in vitamins are among the few foods to be consumed. Because the fruit is a kind of sugar, fructose and fructose-rich insulin (hormone secreted by the pancreas) causes resistance.

- Things to consider in terms of health in diets.

The groups were expected to reach a consensus about the healthiest diet.

A scenario was presented to the students after reaching a group consensus. In the scenario, students were expected to help an individual with obesity in their choice of food in a healthy meal. Specifically, the task of the students was to prepare dishes for the healthy and balanced three meals for the obese individual. When preparing a healthy meal, students had to make use of the diet programs of the scientists to determine which foods or groups of foods should be included at lunchtime. However, it was necessary to decide jointly as a group according to the current information about diets and creativity. The aim here was for students to be able to design a diet as a continuous process like scientists experience during diet preparation, and dietary programs consisting of different and balanced nutrients

After the discussion, students were asked to share ideas about the diets they were studying, the foods the diets provided, and which scientist's diet was more healthy, according to their opinion, with their group members and the whole class. Specifically, the class discussion may involve the following topics:

- Suggested differences in food types, reasons,
- Diet periods,
- Nutritional values of foods recommended in diets,

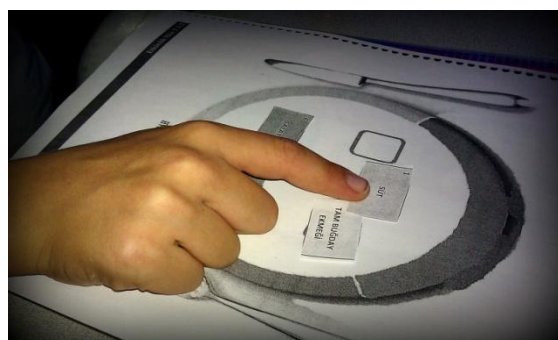
at the end of the process. The learning objective that scientists are subjective should also be emphasized in this section.

The steps that were followed at this stage of the activity are listed below:

1. The teacher pre-cuts the food cards in Appendix 3, puts them into the envelopes, and distributes the envelopes to the groups (to be formed according to the number of students in the class)(Photograph 1).
2. First, students are asked to prepare a diet program with the food from the inside of the envelope, and they are asked to place their diet programs on the paper meal plates (Appendix 4, Photograph 2).
3. The food to be added is limited and food can be placed in the boxes inside the plates.
4. Five items of food per meal will suffice. In addition, students can place the names of the foods that are not in the envelope on blank papers.
5. Finally, students are asked to give a title for their diet.
6. At the end of the process, each group is expected to be able to produce different dietary programs and to present their diet programs together with their reasons to the class (Photograph 3).
7. Even though all groups have been given the same dietary varieties, there should be a class discussion on how and why the dietary meals are formed and varied in diet programs designed.
8. At the end of the activity, formative assessment should be done by distributing the "Formative Assessment Worksheet" (Appendix 5) that measures students' learning of the related science concepts and the NOS themes, namely imagination, creativity, and subjectivity.



Photograph 1. Placement of Food Cards into the Envelopes



Photograph 2. Student Place Food Cards on Meal Plates

CONCLUSION and SUGGESTIONS

Students' Views and Impressions

At the end of the activity, the impressions that the students conveyed were shared by the teachers both in writing and orally with the project team. All opinions and impressions obtained are summarized below:

- It was reported that all students had a better understanding of balanced-healthy diet and they enjoyed while learning during the activity.
- The variety of food given to students encouraged students to research and question which foods are healthier. It was observed that they often tried to obtain information from textbooks, notebooks, and supplementary materials in the process of reaching the right information source.
- During a limited number of food placements on meal plates, it has been

reported that students experienced a democratic group process based on compromise culture.

- It was determined that the group members continuously exchanged opinions with each other during the process and they conducted the research process jointly as a team work.
- It was observed that some group members who have knowledge about the selection of foods offer convincing reasons to other group members for use on the meal plates.
- In addition, Günnur's and Filiz's students' performed the presentation of the meal plates in groups in the class. Although it was not mentioned in the activity instructions, Filiz's students appointed a presenter to present the group's meal. It was reported that these presenters, during scientific presentations, defended with scientific reasons for placing a limited number of five food types in their meal plates.
- After the presentations Filiz asked students to assess whether each other's diets were healthy or not. Students also found healthy and unhealthy foods during meal evaluations. They identified nutrients that needed to be added or removed through mutual exchange of views. During the debate, the teacher emphasized that scientists go through a process similar to the processes they experienced.
- Deniz and Günnur reported that at the end of the process, students in different groups were confronted with different dishes from each other and were quite surprised by the result. Teachers at this stage pointed out that "scientists emphasize the attributes of being able to reach different inferences using the same data" that is, they explicitly emphasize and construe arguments.
- With Filiz's students, it was observed that using creativity and imagination during the decision-making and naming of foods influenced their attitudes towards the activity positively. Some of the names that students give to the diets are as follows: *Protein Bomb, Vegetable Day, Vitamin Store, Day of Health,*

Healthy Weightloss, Healthy Diet, For a Better Life, Healthy Life How Nice!, Dukan Diet, Dietitians are on the Work!

In accordance with all the student opinions and impressions given above, it can be said that the students enjoyed learning with this activity, and by the inquiry-based learning process that they were involved in, their learning environments were enriched. Students also realized that it is possible to obtain successful results related to the same problem with different scientific methods and they also experienced the scientific values such as collaborative culture, team work, communication, and treating different views with respect while they were working cooperatively.

Teachers' Opinions

At the end of the activity, the participant teachers were asked to share their evaluations of the activity and the products related to the activity using a separate evaluation form. Based on the evaluation reports, it was determined that Günnur and Filiz assigned full scores ($3 \times 10 = 30$ points) to all of the criteria included in the assessment scale (rubric), while Deniz gave the average (2 points) to the criteria of "conformity to curriculum standards" and "support for learning" (28 points). The rubric expressions for these two criteria that Deniz gave the average score are "the activity does not fully support the related curriculum standard" and "the activity partially encourages the students to learn the target topics." Günnur and Filiz, on the other hand, chose expressions that "the activity fully supports the related curriculum standard" and "the activity highly encourages the students to learn the target topics."

It is thought that this difference in the justifications of Günnur, Filiz, and Deniz regarding the activity may have arisen for several reasons. The first reason could be the differences in the number of students in each class. For instance, Günnur had two classes which consisted of 17 and 14 students; Filiz had three classes of 17, 15, and 15 students; while Deniz had only one class of 36 students. The high number of students in Deniz's class might have caused difficulties in classroom

management and for students to be guided through the learning process in an activity that requires active participation of the students. Thus, it is recommended that, for the effective implementation of such activities, the *number of students, should not exceed 20-25 students*. Interpretations about number of students in classrooms were also found in other activity evaluation feedbacks received from teachers about different activities.

Secondly, Günnur, and Filiz required their students to prepare their meals as posters in the classroom (Photograph 3) in contrast to Deniz, although this was not mentioned or required in

the activity instructions. It is thought that this difference might have enriched the learning process and thus influenced the opinions of Günnur and Filiz on the effectiveness of the activity. It should be noted that in the process of activity development, the teachers were welcomed and encouraged to make some changes according to their classroom needs, settings, and school infrastructures. In this respect, considering the dynamics of Günnur and Filiz's classes, the poster presentation may have contributed to the development of 21st century skills such as communication, critical thinking, and entrepreneurship in the learning environment of the students (Photograph 3).



Photograph 3. The Poster Presentations of Students About Their Diets

The example above reveals the need for teachers to have an autocontrol mechanism for them to make their own decisions about activity development and implementation considering classroom dynamics, such as prior knowledge of students, classroom availability, student motivation, availability of tools, and equipment. Although it was reported in studies of science education literature that contextualized and content-based NOS activities improve the classroom practices of teachers (Schwartz, 2009) and support the

development of scientifically literate students (Lederman, 2006), there is a limited number of examples of content-specific activities to guide teachers in this regard (Brickhouse et al., 2000; Khishfe & Lederman, 2003; Schwartz, 2009). Therefore, the current study has provided a positive initiative in terms of providing teachers with effective material support that is coherent with the current curriculum requirements for integrating NOS concepts, and getting feedback from the teachers in this regard.

REFERENCES

- Abd-El-Khalick, F., & Akerson, V. (2004). Teaching as conceptual change: Factors mediating the development of preservice elementary teachers' views of nature of science. *Science Education*, 88(5), 785-810.
- Abd-El-Khalick, F., Bell, R. L., & Lederman, N. G. (1998). The nature of science and instructional practice: Making the unnatural natural. *Science Education*, 82(4), 417-436.
- Akerson, V. L., Morrison, J. A., & McDuffie, A. R. (2006). One course is not enough: Preservice elementary teachers' retention of improved views of nature of science. *Journal of Research in Science Teaching*, 43(2), 194-213.
- Boujaoude, S. (1995). Demonstrating the nature of science: Three experiments that help students comprehend scientific principles. *Science Teacher*, 62, 46-49.
- Brickhouse, N. W., Dagher, Z. R., Letts, W. J., & Shipman, H. L. (2000). Diversity of students' views about evidence, theory, and the interface between science and religion in an astronomy course. *Journal of Research in Science Teaching*, 37, 340-362.
- Doğan, N. (2011). What went wrong? Literature students are more informed about the nature of science than science students. *Education and Science*, 36(159), 220-235.
- Doğan, S., Uğurlu, C. T., & Çetinkaya, M. (2015). Öğretmen görüşlerine göre obezitenin eğitim öğretim süreçlerine yansımaları [Obesity's repercussions on educational processes according to the teachers' opinions]. *Elektronik Sosyal Bilimler Dergisi*, 14(54), 173-191.
- Eisenhart, M., Finkel, E., & Marion, S. F. (1996). Creating conditions for scientific literacy: A re-examination. *American Educational Research Journal*, 33, 261-295.
- Esmer, F. (2011). *Exploring representation of nature of science aspects in 9th grade chemistry textbooks* (Unpublished master's thesis). Middle East Technical University, Ankara.
- İrez, S. (2008). Nature of science as depicted in Turkish biology textbooks. *Science Education*, 3(93), 422-427.
- İrez, S., & Turgut, H. (2008). Fen öğretiminde bilim ve bilimin doğası. Ö. Taşkın (Ed.), *Fen ve teknoloji öğretiminde yeni yaklaşımlar [New approaches in science education]* (ss. 233-260). Ankara: Pegem Akademi Yayıncılık.
- Khishfe, R., & Lederman, N. G. (2003). *The development of students' conceptions of nature of science*. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- Khishfe, R., & Lederman, N. G. (2006). Teaching nature of science within a controversial topic: Integrated versus nonintegrated. *Journal of Research in Science Teaching*, 43(4), 395-418.
- Lederman, N. G. (1992). Students' and teachers' conceptions of the nature of science: A review of the research. *Journal of Research in Science Teaching*, 29(4), 331-359.
- Lederman, N. G. (2006). Research on nature of science: Reflections on the past, anticipations of the future. *Asia-Pacific Forum on Science Learning and Teaching*, 7(1), 1-11.
- Ministry of National Education. (2005). *İlköğretim fen ve teknoloji dersi öğretim programı ve kılavuzu [Primary-middle school science curriculum and guide]*. Ankara: Talim ve Terbiye Kurulu Başkanlığı.
- Ministry of National Education. (2013). *İlköğretim kurumları fen bilimleri dersi (3, 4, 5, 6, 7 ve 8. sınıflar) öğretim programı [Foundational education institutions (3, 4, 5, 6, 7, and 8th grades) science curriculum]*. Ankara: Talim ve Terbiye Kurulu Başkanlığı.
- Ministry of National Education. (2017). *Fen bilimleri dersi öğretim programı (ilkokul ve ortaokul 3, 4, 5, 6, 7 ve 8. sınıflar) [Elementary and middle school (3, 4, 5, 6, 7, and 8th grades) science curriculum]*. Ankara: Talim ve Terbiye Kurulu Başkanlığı.
- Organization for Economic Co-operation and Development. (2017). *OECD health statistics*. Retrieved from <http://www.oecd.org/health/obesity-update.htm>
- Osborne, J. (2002). Learning and teaching about the nature of science. In S. Amos, & R. Boohan (Eds.), *Aspects of teaching*

- secondary science perspectives on practice* (pp. 229-237). London: Routledge.
- Özden, M., & Cavlazoğlu, B. (2015). İlköğretim fen dersi öğretim programlarında bilimin doğası : 2005 ve 2013 programlarının incelenmesi [Nature of science in Turkish elementary science education curriculum: An investigation of 2005 and 2013 curricula]. *Eğitimde Nitel Araştırmalar Dergisi*, 3(2), 40-65.
- Özer, F. (2014). *Bir mesleki gelişim programının 5., 6., ve 7. Sınıf öğrencilerinin bilimin doğası hakkındaki görüşlerine etkileri [Impact of a professional development program on 5th, 6th and 7th grade students' views of nature of science]* (Unpublished master's thesis). Abant İzzet Baysal Üniversitesi, Bolu.
- Sağlık Bakanlığı. (2015). *Sağlık için obezite ile mücadele [Struggle with obesity for health]*. Retrieved from <http://www.saglik.gov.tr/TR/belge/1-40258/obezite.html>
- Schwartz, R. S. (2009). *The approach and effectiveness of integrating nature of science instruction during an undergraduate biology course*. Paper presented at the International History and Philosophy in Science Teaching Conference, Notre Dame.
- Türkiye Halk Sağlığı Kurumu. (2015). *Okul sağlığı çalışmaları [School health initiatives]*. Retrieved from <http://beslenme.gov.tr/index.php?lang=tr&page=385>
- Türkiye İstatistik Kurumu. (2015). *Basın odası haberleri [Newsroom news]*. Retrieved from http://www.tuik.gov.tr/basinOdasi/haberler/2015_58_20151008.pdf
- Uskun, E., Öztürk, M., Kişioğlu, A. N., Kırbıyık, S., & Demirel, R. (2005). İlköğretim öğrencilerinde obezite gelişimini etkileyen risk faktörleri [Risk factors of influencing the development of obesity in the primary education students]. *Süleyman Demirel Üniversitesi Tıp Fakültesi Dergisi*, 12(2), 19-25.
- Yalaki Y. (Ed.). (2016). *Etkinliklerle bilimin doğasının öğretimi [Teaching the Nature of Science with Activities]* (2. baskı). Ankara: Pegem Akademi. Retrieved from <http://www.pegem.net/kitabevi/191701-Etkinliklerle-Bilimin-Dogasinin-Ogretimi-e-kitap-kitabi.aspx>

Citation Information

Özer, F., Doğan, N., Çakmakçı, G., İrez, S., & Yalaki, Y. (2017). A contextualized nature of science classroom activity: Junk food! *Journal of Inquiry Based Activities*, 7(2), 93-107. Retrieved from <http://www.ated.info.tr/index.php/ated/issue/view/14>

Appendix 1

Activity Assessment Rubric

Name-Surname of Teacher			
Title of the Activity	JUNK FOOD!	Code	7.1.2
Implementation Details	Date:../.../20	Class:7/ - 5/	Number of students:
Learning Strategy to be used:	Narrative <input type="checkbox"/> Presentation <input type="checkbox"/> Discussion <input type="checkbox"/> Experiment <input type="checkbox"/> Drama <input type="checkbox"/> Other (please specify):		

Please fill the rubric according to your NOS activity implementation experience(s).

Criteria	3	2	1	Points
Subject and content level conformity	The subject and content of this activity is accurate that this age group can understand.	Some points in the subject and content of the activity are not accurate that this age group can fully understand.	The subject and content of your activity does not match the level of students in this age group.	
Conformity to curriculum standards	The activity supports the curriculum standards.	The activity partially supports the curriculum standards.	The activity does not support curriculum standards.	
Appropriateness / adequacy of statements and guidelines	The guidelines given in the activity are clear and sufficient for the meaning and practice of the teacher.	The guidelines given in the activity are generally adequate, however some points are confusing.	The guidelines given in the activity are not clear and sufficient for the teacher to understand and practice the activity.	
Content accuracy	The information used / given in the activity is current and correct.	There are some deficiencies / contradictions in the information used / given in the activity.	The information used in the activity is not up to date and contains scientific mistakes.	
Ease of use for the teacher	The application of activity does not cause any problem in terms of space / material.	There are some problems in the implementation of the activity in terms of space / material.	Implementation of the activity is impossible in terms of space / material.	
Attracting the attention of the learner	The activity attracts the attention of the students and affects their participation in the lesson positively.	The activity draws attention to a significant portion of the students and provides attendance.	The activity does not attract the attention of the students and does not provide attendance.	
Supporting learning	The activity encourages learners to learn target topics.	The activity encourages students to learn part of the target topics.	The activity does not support students' learning of the target topics.	
Appropriateness of the activity duration	The activity is suitable for in-class use as the implementation duration.	There is a time lag in the implementation of the activity.	The duration of the activity is preventing classroom use.	
Appropriateness of the visuals used in the activity material	The quality of the pictures / animations / videos used in the activity material is appropriate and supports the implementation of the activity.	The quality and efficiency of the pictures / animations / videos used in the activity material should be improved.	The picture / animation / videos used in the activity material do not support the quality and application of the content activity.	
Formative Assessment	The formative assessment approaches suggested in the activities are adequate and support learning.	The formative assessment approaches recommended in the activities are partly sufficient.	The formative assessment approaches suggested in the activities are insufficient and far from supporting learning.	
Total				

Based on the implementations I recommend do not recommend this activity to be used in other school classes

(To use in other studies, please consult authors for permission)

Appendix 2

Scientists' Diets Activity Handout

a. Diet 1

On the basis of this diet, high protein intake is essential and the consumption of meat and fish becomes unlimited on certain days, which are designated as "Protein Days." In addition, certain foods can be consumed unlimitedly during certain days during this diet. It can be said that most diets are abandoned at the beginning because of strict diet rules, thus this diet offers more flexibility and a less stressful process to its users. Thus, during this diet, the individual is stress-free and the body is taking high levels of protein. The high amount of protein entering the body plays an important role in the person's weight loss. However, one must pay attention to an important point here. Diets containing high protein should be done under the supervision of a specialist physician. The reason for this is that the high protein that can be taken in the body is likely to cause some problems due to overdose in some organs. As with most dietary types, there are difficulties with this diet. During these ten days, the individual tries to give up the eating habits he has been accustomed to for years and enters the process of adapting to the new eating habits. This adaptation process is given as ten days. If this process can be overcome steadily, it is thought that diet will make the individual healthy. This can be difficult, because the individual cannot eat other kinds of foods. The following details of all diets should not be ignored: given individual differences, it is not expected that different dietary types will produce the same effects in every individual's metabolism.

b. Diet 2

This diet does not aim at short-term, temporary weight loss. Individuals who have succeeded in turning this type of diet into a lifestyle first of all do not gain weight; second, they do not store fat; and finally, after a short plateau, the stored fat is broken and permanent weight loss occurs. Unlike other diets, amounts of food are never mentioned. What is important is that carbohydrates are the "absolutely forbidden" food group that should not be eaten. According to this diet, fat is not a lipid, but a carbohydrate group. When the body gets fat, it does not enter the body as a lipid. It is the combination of inactivity and carbohydrates that causes the storage of human body fat. Moreover, unlike what was previously known, this diet suggests that nuts are beneficial. Walnuts, hazelnuts, peanuts, and almonds can be consumed in abundance. The foods that need to be kept away from are bread, pastries, sugary foods, and processed foods. Fruits that are known to be rich in vitamins are among the few foods to be consumed. Because the fruit is a kind of sugar, fructose and fructose-rich insulin (hormone secreted by the pancreas) causes resistance.

Appendix 3

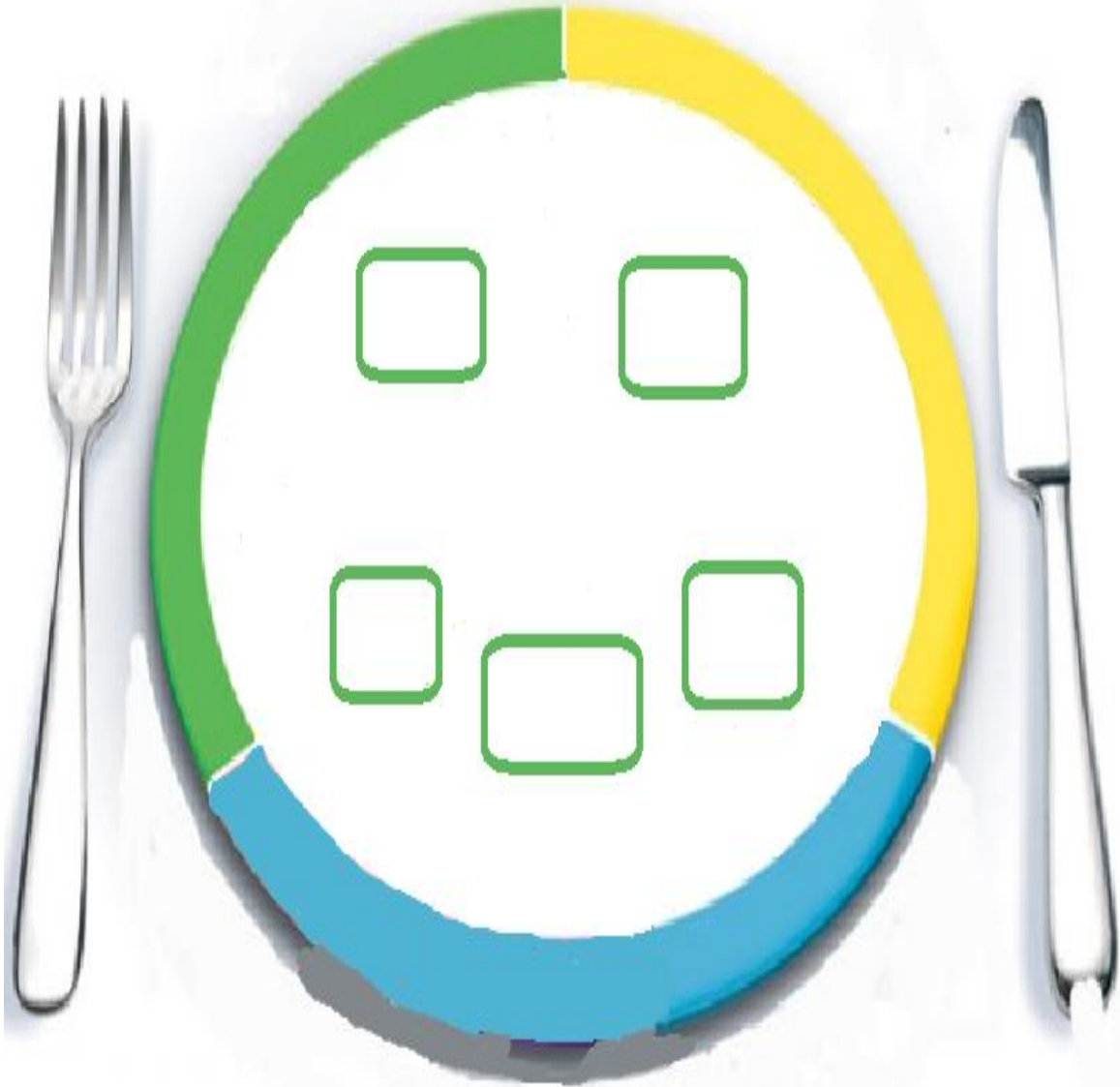
Food Cards (to be cut and put in the envelopes.)

1 MILK	2 VEGETABLE WITH OLIVE OIL	3 HAZELNUTS	4 WALNUTS	5 GRILLED FISH, MEATBALLS, CHICKEN
6 CUCUMBER	7 HAMBURGER	8 FRIED CHICKEN	9 COKE	10 WHOLE WHEAT BREAD
11 APPLE	12 DIET COKE	13 ROQUETTE	14 YOGHURT	15 WHOLE GRAIN BREAD
16 PITTA	17 ROASTED MEAT	18 WATER	19 FATTY CHEESE	20 OLIVES IN BRINE
21 CHIPS	22 BUTTER	23 SOUP	24 RICE	25 CHOCOLATE BISCUITS
26 SESAME	27 HAZELNUT OIL	28 LEGUMES	29 TURKISH RAVIOLI	30 FRIED MEATBALLS
31 OATMEAL PANCAKES	32 PASTA	33 CHOCOLATE	34 PARCLEY	35 TOMATOES
36 BAKLAVA	37 OLIVES WITHOUT SALT	38 ROASTED EGGS	39 COOKED EGGS	40 JUICE
41 TEA WITH ARTIFICIAL SUGAR	42 SAUSAGE	43 PASTRY	44 PEANUT BUTTER	45 FAT-FREE CHEESE
46 FRENCH FRIES	47 DRIED FRUITS	48 SALT FREE AYRAN	49 SUGAR FREE TEA	50 CEASER SALAD

Appendix 4

Meal Plates (To be distributed by the number of groups)

BREAKFAST / LUNCH / DINNER



Appendix 5

Formative Assessment Worksheet (To be distributed to the students individually.)

Formative Assessment Worksheet

Fill in the blanks according to dietary subject matter knowledge. *(Responses of the students may not need to be graded, it is recommended to be returned to students in a short while.)*

Vitamin, Minerals, Diet, Carbohydrates, Proteins, Obesity

- 1. is what is called eating healthy and balanced food.
- 2..... and vitamins act as regulators in our bodies.
- 3. Fat and provide energy for our bodies.
- 4. Fruits and vegetables are abundant in
- 5. Growth and development slows down if the foods containingare not consumed.
- 6. An unhealthy and unbalanced diet may cause

It should be mentioned here that students can reach different conclusions with the same data and that scientists’ decisions are subjective.

Read the following text carefully.

Scientists agree that the extinction (they have all died) of dinosaurs happened about 65 million years ago. However, scientists have different ideas about the extinction of dinosaurs. For example, some scientists think that some dinosaurs disappeared because of volcanic eruptions, some due to climate changes, and some of them say that they died when the Earth was hit by a large meteorite. Although scientists have the same information, why do you think they have different ideas?

.....

.....

.....

.....