



Determination of the 8th Grade School Students' Awareness of Food Dye with the Use of Spectrophotometer*

Hediye Şule AYCAN^{1*} , Tuğçe Yağmur ORHAN¹ , Güliz KAYMAKÇI¹ 

¹Muğla Sıtkı Koçman University, Faculty of Education, Muğla, Turkey.

MAKALE

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Abstract: In the current study aimed to create awareness of color dyes found in foods and beverages on 8th grade students through an experimental activity designed by the researchers. To this end, the experimental activity developed on the basis of 5E learning model including the use of spectrophotometer allowing the practical analysis of food dye was administered to the participants. This study was designed as a case study, one of the qualitative research methods. As the data collection tool, a semi-structured interview form, administered before and after the activity, was used to determine the participants' awareness. By making use of science and technology integration through the developed experimental activity, students were enabled to make scientific observations on a problem encountered in their daily life. In the analysis of the data, content and descriptive analyses were used together. It was found that the activity was effective in raising the participating students' awareness of color dyes in foods and with the inclusion of spectrophotometer into this process, the students' interest was aroused. As a result, it can be suggested that with the inclusion of technological tools such as spectrophotometer into teaching-learning process, activities directed to raising students' awareness of the issues directly related to their health can be enhanced.

Key Words: Spectrophotometer, food dyes, experimental activity, 5E learning model, science education.

*Some part of this study was presented in the International Contemporary Education Research Congress 2016 in Muğla.

Submitted: November 26, 2018. **Accepted:** March 22, 2019.

8. Sınıf Öğrencilerinin Spektrofotometre Kullanımı ile Gıda Boyası Hakkındaki Farkındalıklarının Belirlenmesi*

Öz: Bu çalışmada, 8. sınıf öğrencilerinde, araştırmacılar tarafından tasarlanan deneysel etkinlik ile yiyecek ve içeceklerde bulunan gıda boyalarına yönelik farkındalık oluşturulması amaçlanmıştır. Bu amaçla katılımcılara, gıda boyaalarının pratik analizini sağlayan spektrofotometrenin kullanımını içeren 5E öğrenme modeline dayalı olarak geliştirilen deneysel etkinlik uygulanmıştır. Araştırma, nitel araştırma yöntemlerinden durum çalışması olarak desenlenmiştir. Veri toplama aracı olarak etkinlik öncesinde ve sonrasında katılımcıların farkındalıklarını belirlemek amacıyla yarı-yapılandırılmış görüşme

formu uygulanmıştır. Deneysel etkinlik ile fen ve teknoloji entegrasyonunu kullanarak, öğrencilerin günlük hayattaki bir soruna yönelik bilimsel gözlemler yapması sağlanmıştır. Verilerin analizinde içerik ve betimsel analiz birlikte kullanılmıştır. Etkinliğin, öğrencilerde tükettikleri gıdalar içindeki katkı maddelerine karşı farkındalık oluşturmada etkili olduğu ve bu sürece spektrofotometrelerin dâhil edilmesiyle konuya yönelik ilgilerinin arttığı görülmüştür. Eğitim ve öğretime spektrofotometre gibi teknolojik cihazların dâhil edilmesiyle öğrencilerin doğrudan sağlığını etkileyen konularda bilinçlendirilmesini sağlayan etkinliklerin çeşitlendirilmesi önerilmektedir.

Anahtar kelimeler: Spektrofotometre, gıda boyaları, deneysel etkinlik, 5E öğrenme modeli, fen eğitimi.

*Bu çalışmanın bir kısmı, Muğla’da düzenlenen International Contemporary Education Research Congress 2016 isimli kongrede sunulmuştur.

Sunulma: 26 Kasım 2018. **Kabul:** 22 Mart 2019.

INTRODUCTION

Developments in science and technology have led the way in the formation of social issues and the development of the modern education concept of the 21st century. Teaching methods and environments have been renewed and there have been changes in the existing educational practices to prepare students and instructors for the future. In accordance with these changes, curriculums have also been renewed. In the science curriculum (Ministry of National Education [MoNE], 2018), it is strongly emphasized that “All students must be educated as science literate individuals”. In science education one of the learning environments that can foster science literacy by making it possible to learn by doing and experiencing are laboratories. Laboratory experiences help students develop their critical thinking and creativity. In addition, this process increases students' appreciation of the mechanisms used by scientists to gain knowledge and analyze. Moreover, through laboratory education, students are allowed to engage in in-depth learning (Bes, Sancho, Peleato, Medina, Gomez-Moreno & Fillat, 2003). Today, various educational reforms are being implemented to increase the effectiveness of laboratory practices in science education. In these reforms, approaches that can contribute to the improvement of learning and teaching environments in the laboratory have been adopted. One of these approaches is the inquiry-based learning. In the inquiry-based science education, on the one hand students are provided with experiences that can be taken as the basis in the construction of new information or in the testing of thoughts, they are encouraged to question their thoughts created on the basis of evidence on the other (Köseoğlu & Tümay, 2015, p. 83). In the constructivist approach various learning models (3E, 4E, 5E, 7E) are used. The 5E model is a science teaching model built on experimental activities. The model consists of five stages. These stages are; Engage, Explore, Explain, Extend (or Elaborate) and Evaluate (Wilder & Shuttleworth, 2005). 5E model-based instruction has been reported to increase students' conceptual understanding and higher order thinking skills and to positively affect students' learning motivation by relating what has been learned to their daily lives (Çetin-Dindar & Geban, 2017). Moreover, laboratory activities developed on the basis of the 5E model have been reported to positively affect students' academic achievement and scientific process skills (Açışlı & Turgut, 2011). Hırça (2013), conducted a study on pre-service teachers, reported that the use of 5E model-based animation scenarios for electrical safety awareness improved the technical skills related to electric shock and information of first aid.

Science education should be directed to the accomplishment of learning of science subjects in a holistic manner by establishing connection between science and technology. UV-visible spectrophotometers used in some general chemistry laboratories can determine the absorption spectra of colored or colorless solutions (Aycan & Arslan, 2017;

Dooling, Bodenstedt & Page, 2013; Galloway, Bretz & Noval, 2014; Kılıç-Alpat, Özbayrak-Azman & Alpat, 2018; Sharma, Gulati & Mehta, 2012). These tools rely on the interaction of electromagnetic radiation with matter and are built on Beer Lambert's Law, which is based on the principle that radiation is absorbed or diffused by the atom or molecules that make up the matter. This law states that the amount of light passing through a solution is logarithmically inversely proportional to the length of the path followed by the light in the solution and the concentration of the solution, while the amount of light absorbed is directly proportional (Lema, Alijinovic & Lozano, 2002). Quantitative analyses of some food additives (food dyes, sweeteners, preservatives, etc.) can also be performed with spectrophotometers.

Food dyes are divided into two groups as pigments obtained from natural sources and synthetically obtained pigments. While cochineal carmine, indigotine, anthocyanin, riboflavin and beta-carotene are included in the class of natural colorings, tartrazine (E102), sunset yellow (E110) and ponceau 4R are synthetic dyes (Öncül, 2009). There are many food dyes in the food we use in our daily lives. For example; energy drinks, cakes, pastries and sauces were found to contain food dyes (Altınığde, 1999; Atli, 2010). Clinical studies have shown that tartrazine (E102) in humans, especially in children, triggers asthma, eczema, urticaria and migraine and causes hyperactivity, restlessness and sleep disturbance (Büyükdere & Ayaz, 2016; Lok, Chung, Benzie & Woo, 2011). In addition, there are studies reporting the negative effects of food additives on human health (Şen, Aksoy & Yılmaz, 2017). Although some food additives have such negative effects on health, their consumption by children and young people is increasing with each day. Lok et al. (2011), conducted a study on 142 elementary school students aged at 8-9 in Hong-Kong and found; by using the Food Frequency Survey data, that the color additives other than sunset yellow (E110) are consumed at acceptable levels for his/her age group but it is highly above the acceptable daily intake level (51%) for the nine-year old. Studying on a different age group, Jain & Mathur (2014) found that students in the age group of 13-15 consume sports drinks, energy drinks, cakes, pastries and sauces including food additives than the students in the age group of 15-19.

Problem Statement

It is necessary to raise students' awareness of the foods whose consumption is continuously increasing and which are made more attractive with the addition of food colorings. It is thought that raising this awareness in students at early ages can help to prevent many negative occurrences. In addition, there are studies (Bosma, 1998; Fialho, Rocha & Mello, 1999; Grenger, 2004; Munmai, Ruenwongsa, Panijpan, Barman, Magee & Somsook, 2011; Sharma, Gulati & Mehta, 2012) in the international literature conducted with the participation of undergraduate students using spectrophotometers in teaching-learning process. Though there are studies conducted at university (Arslan & Aycan, 2014; Kılıç-Alpat, Özbayrak-Azman & Alpat, 2018; Küçük, 2011) and high school levels (Carrher, Curry & Tessonier, 2015; Sigmann & Wheeler, 2004) in the international literature. The awareness of food consumption should be imparted to students at early ages. Science education can play an important role in the inculcation of food awareness. In order to raise students' awareness through science education, instructional environments should be enriched and should be made more attractive. Its reported that 5E learning model has positive effects on elementary school students' conceptual understanding (Şahin & Çepni, 2012; Turgut & Gürbüz, 2011) and achievements (Aksoy & Gürbüz, 2013; Sertkaya, 2018) in science education. Moreover, it was thought that 5E learning model would provide convenience and benefit to students in engage and explain stages attention and the introduction of spectroscopic methods, in explore and extend stages obtaining information about food dyes by using the spectrophotometer.

In the current study, it was aimed to design a laboratory activity to inform students about food dyes and increase their interest in the use of technology in science education and to investigate the effects of this activity. To this end, answers to the following sub-questions were sought;

1. What is the effect of the experimental activity on the 8th grade students' awareness of food dyes?
2. Does their awareness of food dyes affect their consumption patterns?
3. What are the students' opinions about the determination of the presence of food dyes in foods and drinks?

METHOD

Research Design

The current study was designed as a case study, one of the qualitative research methods. The case study is used to analyze one or several cases within their own limits (setting, time, etc.) in a holistic manner (Karasar, 2013, p. 83). The main purpose of the current study is to qualitatively evaluate the effect of the experimental activity developed to raise the 8th grade students' awareness of food dye and food consumption in a laboratory setting.

Study Group

The study group of the current research is comprised of thirteen 8th graders (4 girls and 9 boys) attending a private school in the city of Muğla in 2014-2015 school year. In the selection of the study group, the convenience sampling method was employed. The convenience sampling method takes prevention of waste of time, money and labor as the main priority (Büyüköztürk, Çakmak-Kılıç, Akgün, Karadeniz & Demirel, 2010, p. 91). The students participated in the study on a volunteer basis. The identities of the students were kept confidential and they are named as "Participant" and the students were coded as P1 (Participant 1), P2, P3.

Data Collection Tools

As the data collection tool, a semi-structured interview form was used in the current study. The interview form method is used to collect similar data from different people to arrive at similar issues (Patton, 1987, p. 111). The interview form was administered twice during the study. It was first administered to elicit the opinions about food dye and spectrophotometer before doing the activity and then after the completion of the activity to determine whether the activity raised the students' awareness. The interview form was developed by the researchers and its final form was given after receiving the review of the field experts. In the form, there are two multiple-choice questions and there are 7 open-ended questions (Appendix 1).

Data Collection

Preparation and implementation of the activity

While developing the activities, studies were examined related to students should have knowledge and awareness related to food dyes and the use of spectrophotometers in education. By seeking the opinions of field expert content validity of the laboratory activity was established. The activity was conducted in compliance with the constructivist approach. The activity stages were designed according to the 5E model generally used while conducting science education through the inquiry-based approach (Wilder & Shuttleworth, 2005). The 5E model places students in the center of experiences by encouraging them to research, to construct scientific concepts and to relate these concepts to other concepts (Köseoğlu & Tümay, 2015, p. 96). In the "Engage" stage of the activity, first the students were shown some foods they consume in their daily lives to draw their interest and their predictions about the presence of food dye in these foods were asked and then the spectrophotometer was introduced to them. In the "Explore" stage, the experimental activity was conducted to enable students to engage in concrete experiences on the issue. The experimental activity was conducted as a demonstration experiment. Demonstration experiments, in accordance with the constructivist approach, in engage stage of the 5E/7E learning model are used to reveal the students' prior knowledge and motivate. In addition, demonstration experiments are preferred in some

situation such as the experiments are not suitable for the students in terms of safety, lack of materials, the inadequacy of students' psychomotor competences, lack of time, economic constraints (Ergin, Şahin-Pekmez & Öngel-Erdal, 2012, p.24-25). In this study, a demonstration experiment was used due to lack of psychomotor skills of students, limited time and the economic value of materials. In the experimental activity, first solutions related to foods consumed as drink and food dyes were prepared. Then, measurements were performed by using spectrophotometer.

In order to determine the presence of brilliant blue (E133) food dye in the food consumed, the standard addition method, one of the spectrophotometric methods, was administered. The brilliant blue chemical used in the study was of analytical purity and the solutions were prepared with distilled water. Solutions of consumed food (energy drink) and food dye (brilliant blue, E133) were prepared at suitable concentrations and through the spectra taken, their absorption was observed. As the color of the food (energy drink) consumed in the experiment was blue, brilliant blue (E133) chemical was used. In the activity, PG Instrument Photographic T80 + UV/ VIS spectrophotometer and precision scales (Sartorius) were used. Energy drink was filtered by using blue-band filter paper. Black solution for this experiment was distilled water. Stock solution of brilliant blue was prepared as 1g/100 mL spectrophotometric determination was realized with ten times diluted solution and standard addition process realized with 0,2 mL stock solution (Figure 1).

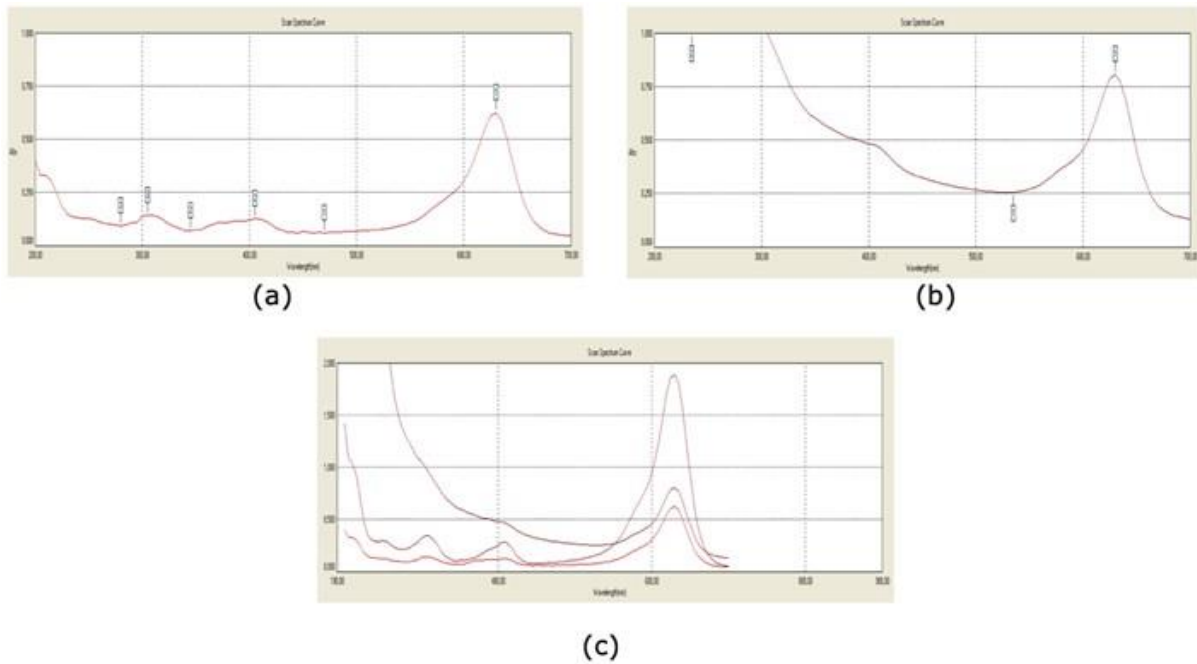


Figure 1. Absorption Values of the Food Consumed and the Brilliant Blue Chemical (a) Brilliant blue 630 nm; (b) The consumed food 630 nm; (c) Brilliant blue, the consumed food and standard addition.

This stage was carried out by the researchers. In the "Explain" stage, the students compared their prior predictions and the data they collected as a result of the experimental activity. Then, they shared their inferences related to the experiment and made scientific explanations on the graphs constructed to demonstrate the experimental data. In the "Extend (Elaborate)" stage, they established links in relation to the presence of food dye in other foods they consume in their daily lives. In the "Evaluate" stage, in line with the scientific information obtained as a result of the experimental activity, a whole class discussion was held about the chemical compounds found in foods (food dyes, etc.) and their potential effects on human health and then the semi-structured interview form was administered. In this activity, the use of the UV/Vis

spectrophotometer device is important in terms of embodying some concepts (relating to lighting-matter interaction) and developing their graphic interpretation skills.

Data Analysis

In the analysis of the collected data, the data obtained through the semi-structured interview form were subjected to the content analysis and then were descriptively interpreted. In the content analysis, the data are first conceptualized and then they are logically classified on the basis of the emerging concepts and then the themes explaining the data are determined (Yıldırım & Şimşek, 2013, p. 259). In the current study, with the themes obtained through the content analysis, a framework was constructed and the responses were descriptively interpreted. In the descriptive analysis, direct quotations are frequently made in order to reflect the opinions of the individuals interviewed or observed more strikingly (Yıldırım & Şimşek, 2013, p. 256). Therefore, direct quotations from the students' responses are given in the current study.

FINDINGS

Findings related to the first sub-problem of the current study "What is the effect of the experimental activity on 8th grade students' awareness of food dyes?"

In order to determine the students' awareness of food colorings, their responses to the third question and fourth question in the semi-structured interview form were analyzed. When the students' responses given to the third question before and after conducting the activity were examined, it was found that they defined food dye as "the matter adding color to foods before the activity. The themes and sample students' responses related to the third question are given in Table 1.

Table 1. Responses given to third question and themes before and after activity

Question 3: What do you understand from food dye?					
Before activity			After activity		
Themes	n	Sample Answers	Themes	n	Sample Answers
Not natural	5	They are matters giving color to foods (P3)	Chemical food dyes	5	Natural and chemical substances causing harms when they are used and found in foods (P3) They are things used to give color to foods and drinks (P5)
Harmful	8	What comes to my mind, when I hear the word "food dye", is dye and harmful agents (P7) Food dye is a kind of dye that is not natural, harmful and posing a threat to human body (P9) They are unnatural, harmful dye agents (P11)	Natural food dyes	4	They are divided into two as harmful and harmless, natural and unnatural (P1)

It is seen in the Table 1 that before the activity, the students' opinions about food colorings as synthetically produced chemicals were that they are harmful substances and after the activity their opinions have changed. According to the Table 1, before the application 5 students thought that the food dye was not natural, 8 students thought that it was harmful yet after the application, 5 students thought that it is chemical and 4 of them thought that it is natural.

The students' responses to the fourth question before and after conducting the activity were examined. The themes and sample students' responses related to the fourth question are given in Table 2.

Table 2. Responses given to fourth question and themes before and after activity

Before activity			After activity		
Themes	n	Sample Answers	Themes	n	Sample Answers
Include chemicals	3	Harmful because they include chemicals (P3)	Both useful and harmful	5	Chemical ones are harmful; natural ones are not harmful (P4)
Not natural	5	Harmful because they are not natural (P9)			In my opinion, they are both useful and harmful because the food colorings derived from plants are useful whereas the chemical ones are harmful (P6)
According to media	3	They are harmful because they harm the body. It is said so in news (P7)	Harmful	8	Harmful because they lead to changes in our body (P7) In my opinion, food dye is harmful because it can make us sick (P10)

The reason behind this disagreement seems to be that some of them see food dyes as harmless substances. On the other hand, some of the students have learned that all of the food dyes are not harmful. According to the Table 2, before the application 3 students think that the food dye includes chemicals, 5 students think it is not natural, 3 students think that we use food dye because of media. After the application 5 students think it is both useful and harmful, 8 of them think that it is harmful.

Findings related to the second sub-problem of the study “Does their awareness of food dyes affect their consumption patterns?”

First the students’ consumption patterns were determined. For this purpose, they were first asked to identify the foods they frequently consume. The foods frequently consumed by the students are given in Figure 2.

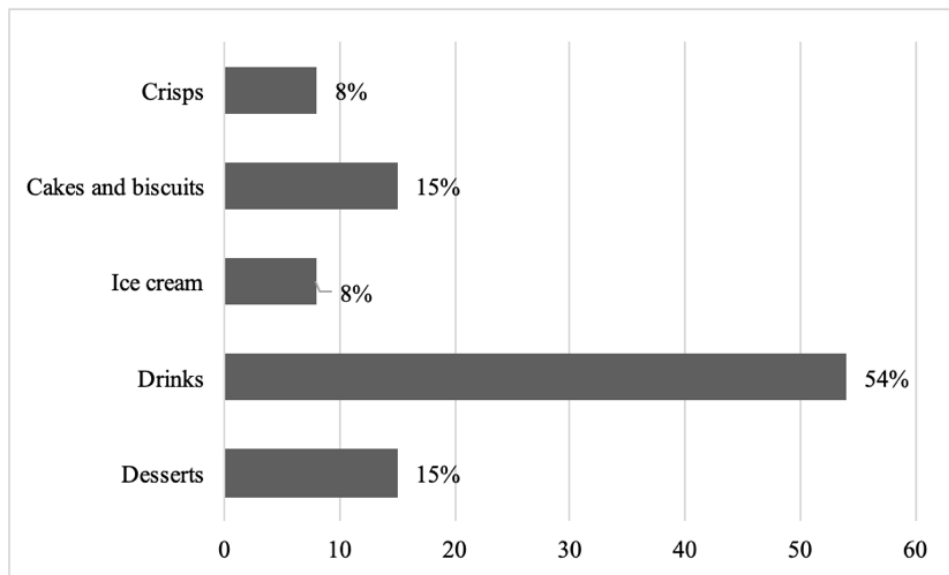


Figure 2. Foods Frequently Consumed by the Students

The most frequently consumed foods by the students are drinks (54%, n=7), while the least frequently consumed foods are crisps (8%, n=1) and ice-cream (8%, n=1). When the students were asked what they consider while buying these products, they responded that they care most about the criterion “enjoying them” (43%, n=6), and least about the criterion “date” (7%, n=1). Then the students’ responses to the 5th question “Do you consume foods including food dye? Why?” and to the 6th question “What do “E” codes

found on the back side of package refer to?" in the semi-structured interview form were evaluated.

When the students' responses given to the 5th question were examined, it was found that they emphasized the themes "I sometimes consume" ($n=5$) and "I usually consume" ($n=8$). Some excerpts showing students' opinions about consuming foods including food dyes are given below;

"Not too much as they include chemicals" (P3)

"I sometimes consume" (P10)

"Even if I consume, I don't know" (P4)

"We consume because there are no natural products in shops" (P9)

"I consume because they are very delicious" (P8)

"Not too much, but a little because if I like its taste I consume; If I don't like, I don't consume" (P11)

When the students' responses given to the 6th question were examined, it was found that majority of them responded as "I have no idea" ($n=11$).

After the completion of the activity, the students emphasized two themes "They consume without knowing" ($n=6$) and "They consume as their taste is good even though they know the fact" ($n=4$). Some students' excerpts are given below;

"Yes, I consume. But I will take more care about it" (P3)

"I consume because I do not know which of the products I buy includes food dye" (K10)

"I sometimes consume because if their taste is good, I cannot control myself" (P11)

After the completion of the activity, it was observed that the students' awareness of E code on the back side of the package increased.

"Europe. It says that there is food dye" (P4)

"It shows whether there is food dye or not" (P7)

"It is the E of Europe. It indicates the color of the food dye in the food" (P13)

Moreover, as families are influential on students' food preferences, the students stated that they would share the information they gained about food colorings with their families.

Findings related to the third sub-problem of the study "What are the students' opinions about the determination of the presence of food dyes in foods and drinks?"

In order to determine the students' opinions about the determination of the presence of food dye, their responses given to the 7th question "How do you determine the presence of food dye in foods?" in the semi-structured interview form were examined.

In response to this question, the students emphasized three themes that are "from its appearance" ($n=6$), "from its taste" ($n=2$) and "from its package" ($n=4$). Some sample statements showing students' opinions on the issue are given below;

"I feel from the taste, and it is also indicated in the ingredients section" (P1)

"From its taste and appearance" (P3)

"If it is colorful, then there is food dye" (P8)

"The presence of food dye is indicated on the packages" (P9)

Thus, it was found that the students mostly prefer observations that are not experimental in the detection of food dye. After the completion of the activity, they used

the phrases "spectrophotometer" ($n=7$) and "by doing experiment" ($n=6$). Some sample student statements are given below;

"We can detect with spectrophotometer" (P3)

"With experiments and letter E on the back of packages" (P6)

"We detect with some methods, experiments. For instance, we can determine by using spectrophotometer" (P13)

DISCUSSION

The findings of the current research have revealed that a positive change has been observed on 8th grade students' awareness of food dye as a result of completing an experimental activity based on the 5E learning model. Similarly, it was reported that the use of 5E learning model in teaching cell divisions, increases the achievement of 8th grade students (Zengin, 2016). In another study conducted with 6th-grade students, it was reported that guide activities prepared in accordance with the 5E learning model increased students' scientific process skills, academic achievements and attitudes towards science (Öztürk, 2013). Prior to the experimental activity, the students defined food dye as a harmful substance used to give color and found them harmful as they are chemical and they stated that they consumed these foods as they are delicious. Lok et al. (2011), stated that consumption of foods including synthetic food dye by students aged at 8-9 is highly over the daily threshold intake level (51%). In another study, it was found that with increasing average age, the consumption of foods including additives (sports drinks, energy drinks, cakes, pastries and sauces) is also increasing (Jain & Mathur, 2014). Our findings are parallel to these findings reported in the literature. The students in the study group of the current research stated that they frequently consume these drinks. As food dyes are used more in drinks when compared to other foods, the students are under risk. The students' awareness of food additives is low. Similarly, Gavaravarapu, Rao, Mendu & Polasa (2009), reported that students are not aware of the food quality standards; thus, their awareness should be raised and that they should be made more familiar with the quality symbols in tags. After the completion of the activity in the current study, the students divided food colorings into two as natural and chemical and they defined the natural ones as harmless and the chemical ones as harmful and they stated that even if they do not want, they have to consume them as they are in any food. Moreover, it was seen that the awareness of E code was created in the students. Sharma, Gulati & Mehta (2012) conducted a study with the participation of undergraduate students and teaching students green chemical concepts and techniques was found to be useful and was found to be allowing students to conduct safe and economical experiments. Munmai, et al. (2011), stated that an application made up of three main activities based on the 5E models (comparison of colors and loading onto the plate, use of the mixture in a computer program and determination of wave lengths with spectrophotometer) created positive effects on the learning of some basic concepts such as nature of colors, light absorption etc. In another study, within the context of a project conducted by a university in cooperation with district schools, experiments including scenarios with real world-based themes and inquiry-based (constructivist) learning and teaching approaches and aiming to use spectrophotometer were carried out with 6-12 grade students. Through this project, the elementary school students were introduced to spectrophotometer and the teachers gained experiences that would be conducive to their professional career (Granger, 2004).

While, before the activity, the students stated that they could detect the presence of food dye mostly through observations that are not experimental, they, after the completion of the activity, stated that they could detect it with spectrophotometer and experiments. Küçük (2011) found that pre-service science teachers think that the use of spectrophotometer in science education can be useful. Studying on a similar sampling, Arslan & Aycan (2014) reported that the pre-service teachers' attitudes positively changed as a result of the experimental activity in which the amount of carmine (E120)

in different drinks was determined with spectrophotometer. Rosa, Antello & Rosa (2018) stated that the laboratory activities in which UV-Vis spectrophotometer was used raised students' awareness of the areas of usage of food colorings in industry. In another study using the spectrophotometer method, it was reported that the experiments designed on the basis of project-based learning approach increased the academic achievement and retention of the pre-service chemistry teachers (Kilingç-Alpat, Özbayrak-Azman & Alpat, 2018).

CONCLUSION AND SUGGESTIONS

The experimental activity conducted in the current study was found to have raised the students' awareness of additives found in foods and with the inclusion of spectrophotometer into the process, the students' interest in the subject was also aroused. Therefore, development and use of activities in which technology is integrated with science education and 5E learning model is used can be suggested. When the relevant literature is reviewed, it is seen that students general engage in such activities at tertiary level; yet, as for elementary and secondary education, such activities are quite limited. Inculcation of awareness of food dye and their consumption at early ages would yield better results. In addition, this study is limited to the developed laboratory activity for use of spectrophotometers to determine food dyes and the study group. With the inclusion of technological tools such as spectrophotometer into education and instruction, activities for secondary level should be developed and enriched so that students' awareness of the issues directly affecting their health can be raised.

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Appendix 1. Semi-structured interview form

1. How often do you consume the following foods? (put them into order of frequency as 3:the most, 2: moderately, 1: the least.)

- | | | |
|---------------------------------|------------------------------------|---|
| <input type="checkbox"/> Crisps | <input type="checkbox"/> Desserts | <input type="checkbox"/> Cakes and Biscuits |
| <input type="checkbox"/> Sweets | <input type="checkbox"/> Jams | |
| <input type="checkbox"/> Drinks | <input type="checkbox"/> Ice-cream | |

2. What do you care about while buying foods? (put them into order of frequency as 3: the most, 2: moderately, 1: the least.)

- | | |
|---|--|
| <input type="checkbox"/> Its being well-known trademark | <input type="checkbox"/> Ingredients |
| <input type="checkbox"/> Adverts | |
| <input type="checkbox"/> Its being high quality | <input type="checkbox"/> Enjoying it |
| <input type="checkbox"/> Date | <input type="checkbox"/> Appearance of its package |

3. What do you understand "food dye" is called? Please explain.

4. Do you think that food dye is harmful? Useful? Explain why.

5. Do you consume foods including food dye? Why?

6. What do you think "E" codes on the back of the package refer to?

7. How do we determine the presence of food dye in foods?

8. Do you share this information with your family and friends?

9. Has your family got any influence on your selecting packaged foods? Please explain.



Exploring Experienced Chemistry Teachers' Science- Teaching Orientations (STOs) via a Card-Sorting Task: Physical-Chemical Change Topic¹

Ayşe Zeynep ŞEN   Canan NAKİBOĞLU  

Balıkesir University, Necatibey Faculty of Education, Division of Chemical Education, Balıkesir, Turkey

MAKALE

<http://dergipark.gov.tr/jotcsc>

Abstract: This research focused on the clarification of science teacher orientations (STOs) as a component of pedagogical content knowledge via a *card-sorting task* containing seven scenarios concerning physical-chemical change topic (PCC) developed by the authors. This research was designed according to the case study model as a qualitative research method that's why the participants were four experienced chemistry teachers who taught in different high schools at ninth grade were examined in their classes without any manipulations. The data were collected through card-sorting task. At the end of the research, it was concluded that the experienced chemistry teachers held different science teaching orientations. It has also been determined that each teacher adopts more than one orientation at the same time. They were in favor of student-centered orientations no matter they perform them in practice. Clarifying experienced chemistry teachers' science teaching orientations with a single instrument cannot be sufficient; different instruments should be used instead.

Keywords: Science teaching orientations, card-sorting task, experienced chemistry teachers, physical-chemical changes.

Özet: Bu araştırmada, yazarlar tarafından fiziksel-kimyasal değişim (FKD) konusu kapsamında geliştirilen yedi senaryodan oluşan kart gruplama aktivitesi ile alan eğitimi bilgisinin bir bileşeni olan fen öğretimine yönelimin aydınlatılmasına odaklanılmıştır. Araştırma, nitel araştırma yöntemlerinden durum çalışması modeline göre gerçekleştirilmiştir. Bu nedenle, katılımcılar dokuzuncu sınıf düzeyinde farklı ortaöğretim kurumlarında kendi sınıf ortamında herhangi bir müdahale olmadan görev yapan deneyimli dört kimya öğretmenidir. Veriler, kart gruplama aktivitesi ile toplanmıştır. Araştırma sonunda, deneyimli kimya öğretmenlerinin farklı fen öğretimi yönelimlerine sahip oldukları sonucuna varılmıştır. Ayrıca, her öğretmenin aynı anda birden fazla yönelimi benimsediği belirlenmiştir. Deneyimli kimya öğretmenleri her ne kadar sınıf içinde uygulamalar bile kart gruplama aktivitesinde genel olarak öğrenci merkezli anlayıştan yana tercihlerde

¹ This study is a part of Ayşe Zeynep ŞEN's doctoral dissertation which was conducted under the supervision of Canan NAKİBOĞLU, and was supported by Balıkesir University Scientific Research Projects Office with the project number of 2015/133.

buldukları belirlenmiştir. Çalışma sonunda deneyimli kimya öğretmenlerinin fen öğretimine yönelimlerinin tek bir veri toplama aracı ile belirlenmesinin yeterli olmayacağı, bu nedenle farklı araçların da kullanılmasının daha uygun olduğu söylenebilir.

Anahtar kelimeler: Fen öğretimine yönelim, kart gruplama aktivitesi, deneyimli kimya öğretmenleri, fiziksel kimyasal değişimler.

INTRODUCTION

Teaching is a precious process for both students and teachers. At the end of the teaching, not only students learn, also teachers learn how to teach. It is because teaching is not only telling the content knowledge to students. It is the knowledge about how to teach the content knowledge to students. The valuable dimension of teaching is learning about teaching.

Shulman (1986) emphasized that content knowledge consists of three categories a) subject matter knowledge, b) pedagogical content knowledge (PCK) and c) curricular knowledge. He defined content knowledge as both chunk and framework of the knowledge in the teacher's mind rather than subject matter knowledge. Pedagogical content knowledge (PCK), the second category of content knowledge, is defined as:

"...the most regularly taught topics in one's area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, and demonstrations in a word, the ways of representing and formulating the subject that make it comprehensible to others. (Shulman, 1986 p. 9)"

Shulman (1987) broadened his classification, and he suggested seven categories as *content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts, knowledge of educational ends, purposes, and values, and their philosophical and historical grounds* (p. 8).

Different models of pedagogical content knowledge have been suggested by other researchers (Cochran et al., 1991, 1993; Fernandez-Balboa and Stiehl, 1995; Grossman (1990) cited in Xiaoyan , 2007; Hashweh, 2005; Marks, 1990; Park and Oliver, 2008a, 2008b; Veal and MaKinster, 1999). Magnusson, Krajcik and Borko (1999) suggested a model in which PCK contains five components as orientations towards science teaching, knowledge of curriculum, knowledge of students' understandings, knowledge of assessment, and knowledge of instructional strategies. Science teaching orientations are one of these components connected to a teachers' knowledge and beliefs about the purposes and goals of science teaching. Science teaching orientations guide teachers' practices (Magnusson et al., 1999).

Orientations towards science teaching

Since science teaching orientations directors the interpretations of this study, science teaching orientations are the conceptual framework for the present study. Differences between teachers' practices provide researchers to become aware of the differences in their minds towards teaching, learning, students, success, etc. Since the classroom is the most powerful environment to reflect teachers' thoughts about shaping and constructing their practices and acting processes (Putnam and Borko, 2000), teachers' practices can be a predictor of teachers' thoughts. Hewson and Hewson (1989) defined conceptions of teaching science as:

"...the set of ideas, understandings, and interpretation of experience concerning the teacher and teaching, the nature and content of science and the learners and learning which the teacher uses in making decisions about teaching, both

in planning and execution. These include curricular decisions and instructional strategies (p. 194).”

In progress of time, researchers widened this knowledge base. Later on, Magnusson et al., (1999) called knowledge base as orientations towards science teaching whose types are process (developing students’ science process skills), academic rigor (challenging students with different activities or problems), didactic (transmitting the subject matter knowledge), conceptual change (overcoming students’ misconception in a manner making them first dissatisfied pre-existing knowledge and then considering adequacy of alternative explanations), activity-driven (performing hands-on activities with the aim of discovery or verification), discovery (helping students to discover the patterns), project-based science (teacher and students plan a project in the light of a driving question and develop a product, reflecting the understanding), inquiry (representing science as an inquiry), guided inquiry (the teacher behaves as a guide and scaffolds students from investigating problems to the end of drawing conclusions) (Magnusson et al., 1999, pp. 100-101).

Each orientation has its purpose. These orientations ranged from the most content-based one to the most inquiry-based one. There is not an obligation to adopting only one orientation. Conversely, a teacher can assume more than one orientation. However, the critical point is that the teacher should prefer an orientation with a valid purpose. A teacher may use the same materials or perform the same experiments in the light of different orientations, but he should design the course under the purpose. In other words, the teacher must reflect the intent of the orientation which he preferred.

Additionally, the teacher can hold multiple orientations even with the most different purposes. This becomes possible when the hold orientation is the most appropriate one according to the context. As a result, teachers should be aware of what orientation is, how it differentiates a course, etc. since he shapes his instruction (assessment, curriculum, understandings, strategies) via his orientation. In the related literature, science teaching orientations were examined via various tools. Some of those researches are like the following: Demirdöğen (2016) delved into the complexities of science teaching orientations and their interaction with the other components of pedagogical content knowledge of prospective science teachers via Content Representation (CoRe). At the end of the research, it was concluded that participants held multiple purposes and goals for teaching science and participants' beliefs about the nature of science do not directly interact with his/her PCK.

Furthermore, beliefs about teaching and learning mostly interacted with knowledge of instructional strategies. Yıldız Feyzioğlu, Feyzioğlu, and Demirci (2016) performed research to identify the science teachers’ science teaching orientations and how their orientations changed according to gender, professional seniority and school context via The Pedagogy of Science Teaching Test. It was found that the participants held guided inquiry. Additionally, female teachers are more than male teachers, teachers with 11-20 years teaching profession more than 1-10 years and teachers working in city-center more than in sub-districts were in favor of guided inquiry orientation. Teachers shaped their orientations based on the physical circumstances of their current school. Mavuru and Ramnarain (2018) investigated how social context shaped Grade 9 Natural Sciences teachers’ orientations via The Reformed Teaching Observation Protocol. In light of findings, it was concluded that social contexts influenced teachers' orientations. Teachers' teachings became more process and activity-driven. Curriculum coverage and exams lost their importance. Instead of them, learners' confidence and motivating students gained importance. Ladachart (2019) aimed to examine the relationship between prospective biology teachers’ science teaching orientation and understanding of nature of science via an open-ended questionnaire called V-NOS and a multiple-choice test called POSST. At the end of the research, it was found that the understanding of NOS may not be an indicator of orientations in favor of inquiry-based.

As seen from the literature, detecting orientations towards science teaching of experienced chemistry teachers' is vital to render their teaching practice. There are several methods to reveal of orientations towards science teaching of teachers. In this study, the card-sorting task was used to disclose the experienced chemistry teachers' science teaching orientations.

This paper offers clarification of science teacher orientations (STOs) as a component of pedagogical content knowledge via a *card-sorting task* contains seven scenarios concerning physical-chemical change (PCC) topic developed by the authors and comparison of STOs with their practice.

Research Question

1. What are the experienced chemistry teachers' science teaching orientations identified via card-sorting task?
2. How was the comparison of the experienced chemistry teachers' choices of the card-sorting task?

METHOD

Research Design

This research was designed according to the case study as a qualitative research method in which how and why questions were asked, the researcher had little control over the events, and the focus was on the participants' real teaching activities (Yin, 2003). In this study, the participants were examined in their classes without any manipulation from researchers, and the investigation of the research questions for every participant teacher constituted each case.

Participants

In qualitative researches, the participants are assigned through purposive sampling to provide the most profound data from relatively small groups. The participants were selected purposefully through criterion sampling (Patton, 2002; Denzin and Lincoln, 2005; Creswell, 2013). In criterion sampling, the researchers choose cases according to pre-determined criteria. The critical point of this technique is that all cases or participants should meet the criteria. The pre-determined criteria were as follows: Having teaching experience more than fifteen years, teaching at the ninth-grade chemistry course, being open to cooperation, and participating voluntarily. Four experienced chemistry teachers consented to the research two weeks before the data collection process. All the participants teaching in different high schools met the predetermined criteria. They were not informed about each other. The participants' original names were not used anywhere in the study. They were referred with given pseudonyms as Toprak, Oya, Nur, and Gonca.

Table 1. The characteristics of the participants

Participants	Nur	Gonca	Oya	Toprak
Gender	Female	Female	Female	Male
Teaching experience (yrs)	32	28	21	18
Type of their current school	Science High School	Vocational High School	Anatolian High School	Anatolian High School
Educational background	Chemistry Teaching	Chemistry Teaching	Chemistry Teaching	Chemistry and Pedagogical Training Program
Post-graduation degree	M. Sc	-	-	-

The research was conducted in different high schools in which the same Chemistry Curriculum in the city center was followed. The schools varied in terms of students' achievement levels. Science high schools had the most upper achieving students.

Data collection sources

In this research, data were collected through card- sorting task.

The Card- Sorting Task

The card- sorting task, was utilized for determining participants' science teaching orientations. In the task, the author prepared different scenarios, each of them representing a different science teaching orientation placed in the PCK model by Magnusson et al. (1999). The scenarios were developed by the researchers in the light of related literature (Aydın, 2012; Friedrichsen and Dana, 2003, 2005). In the end, there were seven different scenarios as following: Didactic, process, activity-driven, guided inquiry, discovery, academic rigor, and conceptual change. Scenarios were utilized after expert opinions and revisions suggested by them. Through the task, the researchers focused more on revealing the participants' knowledge and beliefs rather than identifying their orientation precisely.

The instruction of the card-sorting task was performed in the light of Aydın (2012) and Friedrichsen and Dana's (2003) researches. The card- sorting task was utilized as follows:

1. At first, the first researcher showed the scenarios to each participant for a few minutes to read and examine them.
2. Then the participants were asked to classify the scenarios into three groups; i) best representing their teaching, ii) not representing their teaching and iii) unsure about whether representing their teaching.
3. The researcher asked the following questions to the participants about the scenarios in the first group they assigned as reflecting their teaching:
 - i) What do you expect from this scenario as a teacher?
 - ii) Which scenarios can help you to achieve the goals you have adopted as a teacher?
4. The researcher asked the following questions to the participants about the scenarios in the second group they assigned as not reflecting their teaching:
 - i) What would you do for this scenario to represent your teaching?
 - ii) Why do these scenarios not reflect you?
5. The researchers asked the participants to rank the scenarios in the first group from the best representing to the least representing their teaching. And then, the participants answered the following questions:
 - i) Which criteria did you pay attention in this order? What is the reason for your ranking?
 - ii) What are the common features of these scenarios?
 - iii) Which features of these scenarios apply to you?
6. The researchers asked the participants to answer the following questions about the scenarios in the third group they assigned as unsure whether representing their teaching:
 - i) Why are you not sure about the scenarios in this group?
 - ii) What changes can you make in these scenarios to represent your teaching?
7. Are there any other strategies you prefer besides these scenarios? Could you please explain?

Data analysis

In this study, data were analyzed through content analysis. In this analysis, texts are interpreted by the use of both pre-existing categories and emerged themes, so that data could be reduced and interrogated (Cohen, Manion and Morricon, 2007, p.476). In other words, content analysis is a reducing and sense-making process of qualitative data to determine its consistencies and meanings (Patton, 2002).

At the first step, the card -sorting task was conducted individually for each participant, and the interviews of the card- sorting task were transcribed verbatim. The participants' practices were delineated intensely with the help of field notes. By this way, the data were prepared for analysis.

At the beginning of the analysis process, all transcripts were read several times. The participants' answers and classification of the scenarios placed in the card- sorting task were determined. A table was constituted for each teacher to illustrate the classifications of the scenarios representing their teaching or not.

The findings of each participant were presented individually. After the first author completed the analysis, the second author checked and corrected the misunderstood points.

Findings

In this part, the findings are presented respectively according to the research questions.

The experienced chemistry teachers' science teaching orientations identified via card- sorting task

In this part participants' preferences in the card- sorting task are presented respectively. The first participant was Nur and findings were shown in Table 2.

Table 2. Nur's card- sorting task's findings

Category	Types of science teaching orientations
Representing	Process
	Activity-driven
	Guided inquiry
Not representing	Didactic
	Discovery
	Academic rigor
	Conceptual change
Unsure	-

In card- sorting task, Nur placed the scenarios towards the process, activity-driven, and guided-inquiry orientations into the best-representing category. Her scenarios were varying from the best representing to the least representing with the following order: Activity-driven, process, conceptual learning, guided inquiry. She stated that her reasons to choose these orientations were their congruency with the organization of her teaching, their relevance with laboratory work and the integration of laboratory work to daily life. Conversely, she pointed out that the scenarios towards conceptual change, academic rigor, discovery and didactic orientations did not represent her teaching. For her, didactic orientation's focus was on students' existing knowledge, not on the new knowledge; discovery orientation was not suitable for early degrees, and academic rigor was not practical for teaching dissolution of salt. Even though the students wanted to discover something, Nur thought that this was not possible. She, therefore, assigned these scenarios into not representing the category. She added that there was not a scenario that she was unsure about representing her teaching.

The second participant was Gonca and findings were shown in Table 3.

Table 3. Gonca's card- sorting task's findings

Category	Types of science teaching orientations
Representing	Process
	Guided inquiry
	Discovery
	Activity-driven
Not representing	-
Unsure	Didactic
	Academic rigor

In card- sorting task, Gonca placed the scenarios towards activity-driven, discovery, guided inquiry and process into the best-representing category. Her scenarios were varying from the best representing to least representing with the following order: Process, activity-driven, discovery, guided inquiry, and conceptual change. The reason behind her preferences was, in the most general sense, shift from concrete to abstract. Then she expanded her teaching step by step as following: She prefers starting the lesson with developing students scientific skills through an experiment (process), then using a representation and explaining what happens during the experiment in terms of particle nature of matter (activity-driven), providing students to decide whether an example of physical or a chemical change (discovery), scaffolding students' about designing an experiment (guided-inquiry), with different examples of confusing students and making them dissatisfied about their existing knowledge and then providing them to think more and then enhancing their understanding. There was not any scenario that Gonca thought that was not representing her teaching. At last, Gonca was unsure about that didactic and academic rigor were representing her teaching or not. The third participant was Oya and her findings were shown in Table 4.

Table 4. Oya's card- sorting task's findings

Category	Types of science teaching orientations
Representing	Didactic Activity-driven Discovery Guided inquiry
Not representing	Process Conceptual change Academic rigor
Unsure	-

In card- sorting task, Oya placed the scenarios towards didactic, activity-driven, discovery and guided inquiry into the best-representing category. Her scenarios were varying from the best representing to least representing with the following order: Didactic, discovery, activity driven and guided inquiry. The reason behind her ordering was these scenarios' being congruent with her teaching sequence during a class hour. She preferred didactic orientation for diagnosing students' preparedness level. She said her discovery orientation encouraged students to comprehend the construct of the knowledge as a whole. The scenarios towards process, conceptual change, academic rigor, and misconception orientations were not representing her teaching. According to her, since process orientation requires laboratory work, she had not to hold process orientation. The unavailability of physical circumstances and the intensity of the curriculum limited her to hold process orientation. Therefore, she could not allocate enough time for laboratory work. On the other side, she explained the reason she had kept away from conceptual change orientation was that it made her nervous. She was afraid and felt herself under pressure if she could disorient the students' misconceptions instead of fixing them. Finally, she was unsure that academic rigor orientation represented her teaching but did not explain the reasons. Oya concluded her teaching as driving from simple to complex through connecting both prior and new knowledge. She said she used all the scenarios, but the context made her differentiate the orientation.

The last participant was Toprak and findings were shown in Table 5.

Table 5. Toprak's card- sorting task's findings

Category	Types of science teaching orientations
Representing	Didactic, Activity-driven
Not representing	Process, Guided inquiry Conceptual change
Unsure	Discovery, Academic rigor

In card-sorting task, Toprak placed the scenarios towards didactic and activity-driven, into the best-representing category. His scenarios varied from the best representing to least representing with the following order: Didactic and activity-driven. The reasons for his preferences were his familiarity with that way of teaching, students' low levels of achievement, and practicality of the content, and measurability of the student success. In contrast, he pointed out the scenarios towards process, guided inquiry, and conceptual change in terms of not representing his teaching and not being suitable for his school context. Finally, he was unsure whether the scenarios towards discovery and academic rigor represented his teaching. However, he added that these orientations could be held in different types of schools. During the card- sorting task, Toprak emphasized physical conditions, crowded classes, time as constraints of his teaching. If the conditions were better without any limitation, he would be in favor of process orientation. Unfortunately, he felt obliged to hold didactic orientation.

The comparison of the experienced chemistry teachers' choices of the card-sorting task

In this part, the comparison of all of the participants' choices in the card-sorting task is presented in Table 6.

Table 6. Findings of the comparison of the participants' choices in the card-sorting task

Types of science teaching orientations	Category		
	Representing	Not representing	Unsure
Didactic	Oya, Toprak	Nur	Gonca
Activity-driven	Nur, Gonca, Oya, Toprak	-	-
Academic rigor	-	Nur, Oya	Gonca
Guided inquiry	Nur, Gonca, Oya	Toprak	-
Discovery	Gonca, Oya	Nur	Toprak
Conceptual change	-	Oya, Toprak	-
Process	Nur, Gonca	Nur, Oya, Toprak	-

In card- sorting task, activity-driven was the most preferred science teaching orientation in the best-representing category. None of the participants assigned academic rigor and conceptual change into this category. Furthermore, process was in not representing category more than the others. Since being the most preferred orientation in the best-representing category, in not representing category this orientation was not written. At last, only Gonca and Toprak selected some of the orientations in the unsure category. They were didactic, academic rigor and discovery.

DISCUSSION

In this research, the experienced chemistry teachers' science teaching orientations were determined via card-sorting task. In the beginning, when the participants can be classified

from teacher-centered to student-centered, the order was as following Toprak (the most teacher-centered), Nur, Oya, Gonca (the most student-centered). In card- sorting task, Nur expressed that her science teaching orientations were activity-driven, guided-inquiry and process. She was teaching to the most successful students rather than other participants; that's why she challenged students with difficult questions. Her focus was on chemistry content knowledge as well as students' behaviors. She had taught chemistry through cause-effect relations.

Gonca was the most student-centered teacher despite teaching in a school with students' low level of achievement as much as Toprak's students. In light of Gonca's findings, in card- sorting task Gonca expressed that her science teaching orientations were discovery, process, activity-driven, guided inquiry. She preferred the scenarios providing a shift from concrete to abstract nature of matter. She gave priority to meaningful learning. Even though her students were not successful, interestingly, she refused didactic orientation due to its being superficial according to her. According to her, the philosophy of chemistry was driving her teaching.

Toprak was the most teacher-centered (Friedrichsen, Van Driel and Abell, 2011) teacher in the research and gave priority to transmitting knowledge thoroughly to the students (Magnusson et al. 1999). In card- sorting task, Toprak expressed that his science teaching orientations were didactic and activity-driven. He could determine his orientation as didactic. A teacher with his didactic orientation, asks questions, transmits knowledge directly, pays attention to summative assessment and believes that students have a passive role in learning (Mansour, 2009). His inclinations were in favor of more teacher-centered orientations.

On the other hand, he refused the more student-centered orientations for instance, guided-inquiry. When the reasons behind his preferences were asked, he hides behind students' low level of achievement, accustomedness, not being suitable to his school, crowded classes, inadequate physical circumstances, students' unwilling to everything. He was the most unwilling participant in his teaching. He was complaining about whatever he did in terms of teaching. In accordance with Keller, Neumann and Fischer's (2017) findings, his low level of motivation affected students' interest during the course and students were also unwilling to the course. He perceived himself as the person who transmits the knowledge to the students and anything more. He had not any effort about performing an extra activity to develop students' minds. Moreover, he assigned academic rigor into the unsure category. He was in favor of teaching chemistry as a solid conceptual knowledge base.

Oya was the second student-centered participant after Gonca. In card- sorting task Oya expressed that her science teaching orientations were didactic, activity-driven and guided-inquiry. She refused process orientation since it requires laboratory work and the laboratory's not being suitable for usage. This result was compatible with Ramnarain and Schuster's (2014) research in terms of physical circumstances' influencing teachers' teaching. Additionally, she refused conceptual change with the reason for feeling nervous about fixing students' minds. Teachers adapt the orientations that they feel effective and safe while practising (Ramnarain and Schuster, 2014). But then, she put academic rigor into not representing the category.

When all the findings of participants' preferences, it was seen that activity-driven was the most preferred orientation in the best-representing category. Then guided inquiry was in second place, and discovery and didactic were in third place. Academic rigor and conceptual change were assigned to the best-representing category. It was found that one of the participants, Oya, was in fear of being bad at overcoming a misconception. That's why she avoided conceptual change during her task. It can be conveniently said that participants were aware of student-centered teaching.

For this reason, they were in favor of more student-centered orientations like guided inquiry, discovery and process no matter performing them in practice. Three of the participants assigned process into not representing category due to this orientation's requiring laboratory. They associated process with only laboratory and experiment. Unfortunately, they were not knowledgeable about that not all of the science process skills can be aimed to develop only with experiment. For example, communication can be improved through discussion. As explained before, participants did not select didactic orientation except Nur and activity- driven in not representing category since they mirrored themselves as in the mind of student-centered teachers. The unsure category left mostly blank. The participants were primarily sure about their teaching in their understanding.

In the end, it can be said that in the card-sorting task the participants put the scenarios into different categories. They had held multi orientations similar to the related literature (Aydın (2012), Cohen and Yarden (2009), Friedrichsen and Dana (2005), Üner (2016)). Another result was that physical circumstances, university entrance exam, time, teachers' beliefs, educational system, students' levels of achievement and school context influenced or shaped teachers' science teaching orientations. This finding was congruent with the results gathered from Friedrichsen and Dana's research (2005). Teachers can pay attention to learners' socio-cultural background, everyday experiences, learning context in their teaching. As a result, their orientations can be influenced (Mavuru and Ramnarain, 2018). Due to the lack of resources and full classes teachers can lead to teacher-centered teaching activities (Yıldız Feyzioğlu, Feyzioğlu and Demirci, 2016). In addition to these teachers' educational background have potential on their different science teaching orientations. Because, in Ladachart's (2019) research, prospective biology teachers' orientations varied between active direct and guided inquiry as a result of their prior experiences in high school as students where science was taught through hands-on activities and guided inquiry. Depending on the differentiation of teachers' science teaching orientations, their knowledge of teaching strategies differed synchronously. As Demirdöğen (2016) stated that beliefs about teaching and learning interacted knowledge of instructional strategies (p. 518) in other words teachers' teaching practice.

In the light of these results, it can be suggested that experienced chemistry teachers should be aware of what science teaching orientation is, how they can redound on teaching practice, in which circumstances they can be differentiated. Also, prospective chemistry teachers should learn the importance of science teaching orientation in an undergraduate degree. Both experienced and prospective teachers should be knowledgeable about science teaching orientations influence on teaching.

Uncovering a teacher's science teaching orientations via only interviews may be performed easily due to its requirement of less time than observing teaching practice in the classroom. Also, observation requires access to the class (Boesford, 2015). And the researcher has to struggle more in the observation process. But on the other hand, despite these challenges science teaching orientations can be revealed accurately when incorporating observation into data collection. Because, teachers can sail under false colors, in other words, can behave differently from their own. For the next researches, associating the card-sorting task with teaching practice can be more valuable.

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John Dewey'in Demokratik Yaşam Felsefesinin Fen Bilimleri Dersi Öğretim Programlarına Yansıması: Türkiye ve Yeni Zelanda Örneği

Zeliha KIVANÇ  , Abdullah AYDIN  

1Ahi Evran Üniversitesi, Fen Bilimleri Enstitüsü Yüksek Lisans Öğrencisi, Kırşehir, Türkiye
2 Ahi Evran Üniversitesi, Eğitim Fakültesi, Matematik ve Fen Bilimleri Eğitimi Bölümü,
Fen Bilgisi Eğitimi Anabilim Dalı. Kırşehir, Türkiye

MAKALE

<http://dergipark.gov.tr/jotcsc>

Öz: Bu çalışmanın amacı, John Dewey'in ifade ettiği demokratik kültürü yaşam felsefesi haline getirmiş olan bireylerin özellikleri açısından Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim Programlarında bireylerden sahip olması beklenen davranışlar arasındaki benzerlikleri incelemektir. Bu araştırmada, doküman incelemesi modeli kullanılmıştır. Verilerin toplanmasında Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim Programları kullanılmış ve John Dewey'in Okul Yönetiminde Demokrasi kitabından yararlanılmıştır. Fen Bilimleri Dersi Öğretim Programlarına ilgili kurum ve kuruluşların resmi web sitelerinde yayınlanmış olan yazılı kaynaklardan ulaşılmıştır. Verilerin analizinde, Yeni Zelanda ve Türkiye öğretim programında bireylerden beklenen davranışlar ve John Dewey'in demokratik kültürü yaşam felsefesi haline getiren bireylerin özellikleri ile benzerlikler yönünden karşılaştırılmıştır. Türkiye ve Yeni Zelanda da mevcut ifadelerin kısmen yaşam felsefesi ile benzerlik (ima, ifade, vurgu) gösterdiği sonucuna ulaşılmıştır.

Anahtar Sözcükler: Demokratik yaşam felsefesi, Fen bilimleri dersi öğretim programı, Türkiye, Yeni Zelanda

Sunulma: 24 Mart 2019. **Kabul:** 29 Mart 2019.

Reflection of John Dewey's Democratic Life Philosophy on the Curricula of Science: The Cases of Turkey and New Zealand

Abstract: The purpose of this study was to examine the characteristics of individuals who have adopted the democratic culture expressed by John Dewey as a life philosophy and the expected behavior of individuals in Science Curricula in New Zealand and Turkey in terms of similarity. In this research, document review model was used, Turkey and New Zealand Science Curricula were used for data collection and benefited from John Dewey's book entitled Democracy in School Administration. Written sources on official websites of relevant institutions and organizations have been used in order to reach the curricula. In data analysis the expected behaviors in the curricula of New Zealand and Turkey and the characteristics of the individuals who have adopted John Dewey's democratic culture as life philosophy were compared in terms

of similarities. In Turkey and New Zealand has been reached the conclusion that the current expressions showed similarity (implication, expression, emphasis) with the philosophy of life.

Key Words: Democratic life philosophy, Science curriculum, Turkey, New Zealand

Submitted: March 24, 2019. **Accepted:** March 29, 2019.

GİRİŞ

Eğitim, bireyin kendi yaşantısı sonucunda meydana gelen istendik yöndeki davranış değişikliğidir (Ertürk, 1982). Bu tanım ülkemizde yaygın olarak kullanılmakla birlikte genel olarak eğitim tanımlarında, bireyde davranış değiştirme ya da davranış geliştirme süreçleri vurgulanmaktadır. Yeşil (2004)'e göre eğitim sadece bilgi verme işlemi değil aynı zamanda davranış geliştirme ve bireye sosyal yön verme sürecidir. Tezcan (1985) eğitimi bireyin olumlu değerlerdeki davranışlarının gelişme süreci olarak tanımlarken, Bilasa ve Taşpınar (2016) yaşam boyu devam eden süreç olarak, Yıldırım ve Şimşek (2008) ise davranış örüntülerini değiştirme, geliştirme ve bu örüntülere katkı sağlama süreci şeklinde tanımlamışlardır. Vurgulanan bu süreçler, Kan (2018)'e göre eğitim kavramına karşılık gelmekte ve eğitim kavramını derinleştirmek için bu karşılığın bilinmesi gerekmektedir.

Hotaman (2017)'a göre eğitimin karşılığı olan bu süreç, gerçeğin kapsamı şeklindedir. Gerçeklik, Descartes (1647) tarafından "Evrende hareketsiz (durağan) hiçbir şey yoktur" (çev. Akın, 2007, s.24) şeklinde belirtilmektedir. İfade edilen belirti, eğitimin süreçle birlikte değişimleri de beraberinde getirdiğinin kanıtı şeklindedir. Bu değişimler, toplum tarafından bireye kazandırılmak istenen davranış, bilgi, beceri, tutum gibi eğitim programlarının felsefi nitelikli sayıltılarıdır (Hotaman, 2017).

Eğitim programları hazırlanırken, sistemi oluşturan toplumun kültürel özellikleri göz önünde bulundurulmaktadır (Özdemir, 2012). Bu sebeple farklı eğitim sistemlerinde okullar kademe bakımından benzerlik gösterse bile halkın benimsediği eğitim felsefesi nedeniyle programlarda farklılıklar olabilir (Özdemir, 2007). Farklılıklara rağmen, insani ihtiyaçlar evrenseldir ve insan eğitime muhtaçtır (Özdemir, 2012). İfade özgürlüğü, işaret edilen ihtiyaçların önemli unsurlarından biridir. Kişilik ifade ile vücut bulur ve birey kişisel ifade ile kendini gerçekleştirir, geliştirir (Erdoğan 2001). Okutan (2010) bu özgürlüğün insana önem veren ve onu merkezde tutan bir anlayışla yani demokrasi ile mümkün olacağını belirtmektedir.

Demokrasi kavramı tarihsel süreç içinde toplumların gelişmişlik düzeyine göre farklı anlamlarda kullanılmıştır. Kesici, Pesen ve Oral (2017), demokrasiyi insanlığın ulaştığı en iyi yönetim şekli olarak tanımlarken, Ertürk (1981) hükümet biçimi olmasından ziyade yaşam felsefesi olarak nitelemektedir. Hotaman (2010)'a göre demokrasi toplumsal yaşayış açısından düşünüldüğünde bir hayat biçimidir. Dewey (1916) ise demokrasiyi ekonomik düzeyleri, etnik kökenleri ve milli sınırları kusur gibi görmeden bireylerin bir arada yaşayabildiği bir yaşam şekli olarak ifade etmektedir (akt. Kartal, Öksüz, Öztürk ve Demir, 2018). İfade edilen demokrasinin toplumlarda sürekliliğinin sağlanması ve korunması için bireyler demokrasiyi özümsemiş olmalıdırlar (Dewey, 1916). Thomas Jefferson bu özümseme için uygun kültür koşullarının oluşturulması gerekliliği üzerinde durmuştur (Öztürk, 2008). Dewey'e göre demokrasi, problemin çözümüne akılcı bir yaklaşım sağlayan bir hayat tarzı olduğu için işaret edilen koşulların oluşturulmasında demokrasi eğitimi hem çocuklar hem de yetişkinler için önemlidir (Shook, 1970 s. 113).

Farklı kùltùrlere sahip toplumların huzur ve barış ierisinde birlikte yařayabilmeleri iin bireylerin farklılıklara saygı duyan karakterler olarak yetiřtirilmesi gerekmektedir (Topcubařı ve Polat, 2017). Farklılıklara saygı, ancak farklılıklara raėmen eřit şartların saėlandığı ortamlarda kendini gùsterebilir. Bu yùzden eėitimde fırsat ve imkân eřitliėi vazgeilmez bir unsurdur (Brubacher, 1962 akt. Bakır, 2007). Bu eřitlik 2023 eėitim vizyonunda, her ocuėun olabileceėinin en iyisi olmak iin seeneklere sahip olması ve bunu eėitim hayatı boyunca hissetmesi, seėtiėi yolda ilerleyebilmesi ve potansiyelini ortaya ıkarabilmesi iin yeterli fırsata kavuřması gerektiėi řeklinde belirtilmiřtir. Ayrıca bunun gerekleřebilmesi iin insanı merkeze alan bir felsefeye yer verileceėi ifade edilmektedir (Milli Eėitim Bakanlıėı [MEB], 2018).

Cumhuriyet'in ilk yıllarında Mustafa Necati tarafından Atatùrk'ùn eėitim felsefesi ve John Dewey'in pragmatizm felsefesi bir araya getirilerek, John Dewey'in 1924 yılında Tùrk Eėitim Sistemi hakkında hazırlamıř olduėu raporun bir kısmı İlerlemecilik (progressivism) felsefesi yùnùnde uygulamaya konmuřtur (Kocabař, 2008). Cumhuriyet dòneminde bařta Atatùrk olmak üzere eėitimciler bu felsefeyi benimseyerek uygulamıřlardır (Bal, 1991).

İlerlemecilik; demokratik eėitim anlayıřına sahip, okul ve yařamın i ie olduėu, bireysel, biliřsel ve aynı zamanda rekabeti ortadan kaldıran iřbirliėine dayalı bir eėitim felsefesidir (Keskin ve řahin, 2018). Bu felsefeyi benimseyenler dùnyanın sùrekli deėiřmekte olduėunu ve deėiřimin evrenin en temel özelliėi olduėunu savunurlar (Tuncel, 2004). Onlara gùre evrende mutlak doėru yoktur ve doėru bilinen bir řeyin farklı olduėuna yùnelik bir kanıt ortaya ıkarsa o doėru deėiřir (Kop, 2004). Bu dùřünce ilerlemeci felsefenin bilimsel dùřünme yoludur (yansıtıcı dùřünme) ve bu yol kendi kendine dùřünerek baėımsız òėrenmede etkilidir (Tuncel, 2004). İlerlemecilik, yaratıcı bireylerin yetiřtirilmesini ve onların deėiřen şartlara akıllıca bir yaklařımla uyum saėlamalarını mùmkùn kılar (Walker, 1990).

İlerlemecilik geleneksel eėitime karřıt bir yaklařım olmamakla birlikte toplumsal yařam sorunlarının gemiřle doėrudan iliřkili olduėu ve kùklere inmeden çözüm yollarının bulunamayacaėı iin deneyimi sùrekli bir geliřim gùcü olarak ele alan eėitim felsefesidir (Dewey, 1938). İlerlemeciliėin ilk izleri, Rousseau'nun Naturalizmi ile Pestalozzi'nin İzlenimciliėe dayalı òėretim yùnteminde karřımıza ıkmaktadır (Gutek, 2001 s.97). Dewey (1899) kendi eėitim sistemini oluřtururken Rousseau'nun insan doėasını ònemseyen ve onu ıkıř noktası olarak gùren anlayıřı benimsemiřtir. Bu anlayıř bařlangıta ilerlemecilik olarak anılmakla birlikte bir eėitim kuramı olmaktan ok bilgi kuramı olan yapılandırmacılık (constructivism) olarak ortaya ıkmıřtır (Peirce, James, Dewey, 1901).

Yapılandırmacılık, probleme dayalı òėrenme ve proje tabanlı òėrenme uygulamalarında, iřbirlikli òėrenme etkinliklerinin dùzenlenmesinde, etkinlik ve òėrenci merkezli program tasarımlarında etkili bir yaklařımdır. Bu yaklařıma gùre evreden elde edilen yeni bilgi ile òėrenmenin doėrudan gerekleřmesi beklenilmez, yeni bilgi bireyde var olan ònceki bilgiler ile yorumlanır, organize edilir ve yeni anlamlar ıkartılarak iselleřtirilir (Fosnot, 2007). Okullar belirli yaklařımlar ve òėretim teknikleri ile bilgiler vermektedirler. Bu bilgilerin elde edilmesinde kullanılan yollar bireylerin merakını kùreltme, gùzlem ve deney yetilerini kaybetme ya da birbiriyle tutarlı olmayan bir sùrù arala tıka basa doldurulmuř olması halinde bireylerin hi okumamıř kiřiler kadar bile etkin olamaz hale gelmesine sebep olur (Dewey, 1939).

Yapılandırmacılıėın bařlangıcı olan ilerlemecilik pragmatizmden etkilenmektedir ve Pragmatizm deėiřmeye baėlı olarak insan eylemlerinin kendine faydalı olması ve verdiėi faydanın òlüsünün sorgulanmasını esas alır (Bakır, 2007). Papini'ye gùre pragmatizm yùzlerce farklı odaya aılan

oteldeki koridorlar gibidir nasıl ki her biri farklı bir odaya ait olan kapılar aynı koridora açılıyorsa pragmatizmde her biri farkı düşünceye sahip fikirlerin kesiştiği noktadır (akt. Yücesan, 2017). Bu metafor pragmatizmin elde edilmiş olan sonuçlar değil de bu sonuçlara ulaşmada kullanılan bir yöntem oluşunu düşündürmektedir.

Pragmatizm felsefesinde Dewey özgün bir yere sahiptir, bu özgünlük O'nun pragmatizmi bir felsefe olarak pratik alanda sınanması için inisiyatif almış ve "araçsalcılık" başlığında bir dünya görüşüne dönüştürmüş olmasının neticesidir (James, 1907). Dewey'e göre eğitim, pragmatizm ile ele alındığında insana fayda sağlayan edimleri merkeze alarak özgürlüğe giden yolda yaşama hazırlıktan öte yaşamın kendisidir, dolayısı ile eğitim gerçeğe giden bir araç değil gerçeğin kendisidir (Özsoy, 2009) şeklindedir. Pragmatizm felsefesinin amacı sürekli değişen şartların oluşturduğu problemlere güncel ve göreceli çözümler sunarak değişime açık yöntemler geliştirmektir, bu anlamda geliştirilebilmiş en iyi yöntem demokrasidir ve demokrasi eğitimle entegre olmuş bir düşünce sistemidir (Dewey, 1916).

Bu düşünce sistemi, eğitim ve öğretim programları hazırlanırken bireylere kazandırılmak istenen davranışlar olarak ortaya çıkmaktadır ve bu davranışların yasalar, ilkeler ve yönetmelikler kararı ile programlarda yer alması zorunludur (Saracaloğlu, Evin ve Varol, 2004). Eğitim ve öğretim programlarında yer alan demokratik davranışların; John Dewey'in demokratik yaşam felsefesi ile benzerliğinin incelenmesi o ülke vatandaşlarının demokrasiye bakış açıları hakkında bilgi verebilir.

Alanyazın incelendiğinde okullarda demokrasi eğitimi konusunda pek çok çalışma mevcuttur. Bu çalışmalardan bazıları şu şekildedir:

Torres (1998) demokrasi, eğitim ve çok kültürlülük başlığında küresel bir dünyada vatandaşlık ikilemelerini incelemiştir. Roth (2001)'de demokrasi, eğitim ve vatandaşlık konusunda, demokrasiyi benimsemiş vatandaşların eğitimi üzerine çalışma yapmıştır. Dünder ve Ekici (2019) tarafından Viyana ve Diyarbakır'daki ortaokul öğretmenlerinin demokrasi eğitiminin içeriğine yönelik görüşleri karşılaştırılmıştır. Kartal ve diğerleri (2018) yılında Polonya-Türkiye sınıf öğretmeni adaylarının demokrasi algısını karşılaştırmıştır. Kesici ve diğerleri (2017) öğretmenlerin sınıf içindeki demokratik davranışlarını çok yönlü değişkenler bazında incelemiştir. Özsoy (2009) demokrasi ve eğitim alanında Dewey'in bakış açısı ile Türk modernleşmesini analiz etmiştir. Saracaloğlu, Evin ve Varol (2004) İzmir'deki öğretmen ve öğretmen adaylarının demokratik tutumlarını karşılaştırmalı olarak araştırmışlardır. Topcubaşı ve Polat (2017) eğitim programındaki farklılıklara saygı eğitiminin öğrencilerin bu konudaki düzeylerine etkisini ölçmüştür. Yeşil (2004) demokrasi ve insan hakları eğitiminde kullanılan yöntemleri incelemiştir. Okutan (2010) Türkiye'de demokrasi eğitiminin önemi üzerine çalışırken, Hotaman (2017) demokratik bir eğitim programı üzerine çalışmıştır. İncelenen çalışmalar genel olarak demokrasi eğitiminin nasıl uygulanması gerektiğine yönelik vurgular içermektedir.

Bu çalışmada Türkiye ve Yeni Zelanda öğretim programlarında yer alan bireylere kazandırılmak istenen demokratik davranışlar ve John Dewey'in demokratik kültürü yaşam felsefesi haline getiren bireylerin özellikleri arasındaki benzerlikler karşılaştırılmıştır. İşaret edilen ülkelerde vatandaşlar farklı din ve etnik kökenlere sahipken bu ülkelerde birden fazla dil konuşulmaktadır. Tüm bu farklılıklar ülkelerin kültürel zenginliğini oluşturmakla birlikte demokrasiye duyulan gereksinimini de artırmaktadır. Türkiye demokratik haklar ve kişisel özgürlükler bağlamında gelişmekte olan bir ülke iken Yeni Zelanda bu konularda en gelişmiş ülkeler arasında yer almaktadır (socialprogress.org [SPI], 2018). Gelişmekte olan bir ülke ile kendisini bu anlamda

geliştirmiş bir ülkenin öğretim programının yukarıda belirtilen özellikler bakımından incelenmesi sonucunda gelişmekte olan ülkenin demokrasi eğitiminde nasıl bir yol izlemesi gerektiğine yönelik bazı önerilerde bulunulabilir.

Araştırmanın Önemi

Karşılaştırmalı eğitim, "Farklı kültürler ve farklı ülkelerde, iki veya daha fazla eğitim sisteminin benzerlikleri ve farklılıklarını tanımlamaya yardım eden, benzer görünen olguları açıklayan ve insanları eğitme yolları hakkında yararlı teklifler getiren bir disiplindir" (Türkoğlu, 1984, s. 18).

İlgili konuya yönelik alan yazınlarına bakıldığında adı geçen konu ile ilgili ülkeler arasında karşılaştırmalı eğitim çalışmalarının yapılmadığı görülmektedir. Bu çalışmanın ise araştırmacıları işaret edilen boşluğu doldurmaya yönlendireceği umulmaktadır.

Araştırmanın Amacı

Bu çalışmada John Dewey'in ifade ettiği demokratik kültürü yaşam felsefesi haline getirmiş olan bireylerin özellikleri ile Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim Programlarında bireylerden sahip olması beklenen davranışları (21. Yüzyıl bireylerinden beklenen davranışlar) benzerlikler yönünden incelenmesi amaçlanmıştır. Bu kapsamda aşağıdaki sorulara cevaplar aranmıştır.

- i. Her iki ülkenin adı geçen programlarında bulunan 21.Yüzyıl bireylerinde olması gereken özellikler John Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri ile ima yönünden benzer midir?
- ii. Her iki ülkenin adı geçen programlarında bulunan 21.Yüzyıl bireylerinde olması gereken özellikler John Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri ile ifade yönünden benzer midir?
- iii. Her iki ülkenin adı geçen programlarında bulunan 21.Yüzyıl bireylerinde olması gereken özellikler John Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri ile vurgu yönünden benzer midir?

YÖNTEM

Bu çalışmada, doküman incelemesi modeli kullanılmıştır. Doküman incelemesi; araştırılmak istenen olgu veya olgular hakkındaki bilgileri içeren yazılı materyallerin analizi şeklinde tanımlanmaktadır (Best, 1959; Rummel, 1968; akt. Karasar, 2005). Var olan kayıtları ve belgeleri inceleyerek veri toplamaya belgesel tarama denir (Karasar, 2005). Bu veriler olguyu en iyi yansıtan, ona en yakın ve onunla bütünleşen belgedir (URL-1).

Verilerin Toplanması

Veri toplama aracı olarak, Türkiye ve Yeni Zelanda öğretim programları kullanılmış ve John Dewey'in Okul Yönetiminde Demokrasi kitabından yararlanılmıştır (Milli Eğitim Bakanlığı [MEB], 2018; YKI [New Zealand Ministry of Education], 2017); Dewey, 1965).

Öğretim programlarına ulaşmak için ilgili kurum ve kuruluşların resmi web sitelerinde yayınlanmış olan yazılı kaynaklar kullanılmıştır (www.education.govt.nz & www.meb.gov.tr). Yeni Zelanda Fen Bilimleri Dersi Öğretim Programındaki bireylerden beklenen davranışlar İngilizceden Türkçeye çevrilmiştir.

Verilerin Analizi

Çevirisi yapılan davranışlar ve Türkiye Fen Bilimleri Dersi Öğretim Programında bireylerden beklenen davranışlar, John Dewey'in demokratik kültürü yaşam felsefesi haline getiren bireylerin özellikleri ile benzerlikler yönünden karşılaştırılmıştır. Bu karşılaştırmalar ise ifade, vurgu, ima yönünden yapılmıştır. Bunlar Yıldırım (2015) tarafından,

- İma; dolaylı olarak anlatma üstü kapalı olarak belirtme,
- Vurgu; dil biliminde, bir yazı veya konuşmada sürekli olarak öne sürülen, önemle belirtilmek istenen düşünceye dikkati çekmek, belli bir noktayı altını çizerek belirtme,
- İfade; deyiş, söyleyiş veya anlatım

biçiminde tanımlanmıştır.

Bu tanımlar birer örnekle şu şekilde açıklanabilir;

- John Dewey'in yaşam felsefesindeki "Görevinin bilincindedir" maddesi ile Yeni Zelanda müfredatındaki "problem çözer" ifadesi ima yönünden benzerlik içermektedir ve burada ima edilen kavram, sorumluluktur.
- John Dewey'in yaşam felsefesindeki "Çoğunluğun kararlarına uyar" maddesi ile Yeni Zelanda'da "Başkalarının fikirlerine katılır ve katkıda bulunur" ifadesi vurgu yönünden benzerlik içermektedir ve burada vurgulanan kavram, farklı fikirlere saygı/uyumdur.
- John Dewey'in yaşam felsefesindeki "Grup halinde çalışmaya isteklidir" ifadesi ile Yeni Zelanda müfredatındaki "başkalarıyla çalışır" maddesi ifade yönünden benzerlik göstermektedir ve burada ifade edilen kavram, başkalarının fikir ve düşüncelerine saygıdır.

Bu tanımlamaların rehberliğinde karşılaştırma yapılırken bir araştırmacı, üç fen eğitimi uzmanı birbirlerinden bağımsız bir şekilde benzerlikleri tespit etmişlerdir. Bu benzerlikler çalışmanın güvenilirliği için ortak olan ve olmayan görüşler olarak sınıflandırılmıştır. Elde edilen görüşlerin güvenilirliği, güvenilirlik katsayısı hesaplama formülü kullanılarak 0,75 olarak hesaplanmıştır. Sonucun 0,70 ve üzeri değerinde bulunması araştırmanın güvenilirliğini sağlamaktadır (Miles ve Huberman, 1994).

$$\text{Güvenirlilik} = \frac{\text{Görüş Birliği}}{\text{Görüş Birliği} + \text{Görüş Ayrılığı}} \times 100$$

Şekil 1. Güvenirlilik Katsayısı Hesaplama Formülü (Miles ve Huberman, 1994)

Tablo 1. Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim Programlarında Karşılaştırılan 21.Yüzyıl bireylerinden beklenen davranışların Güvenirlilik Yüzdesi

Görüş birliği(f)	Görüş ayrılığı(f)	Güvenirlilik yüzdesi(%)
3	1	%75.00

Yukarıdaki tablo incelendiğinde karşılaştırmanın güvenilir olduğu tespit edilmiştir.

Sınırlılık

Bu çalışma, Türkiye’de 2018 ve Yeni Zelanda 2017 yılında hazırlanan Fen Bilimleri Dersi Öğretim Programlarında bulunan 21.Yüzyıl bireylerinden beklenen davranışlar ve John Dewey’in demokratik yaşam felsefesine sahip bireylerin özellikleri ile sınırlıdır.

BULGULAR

John Dewey’in demokratik kültürü yaşam felsefesi haline getiren bireylerin özellikleri ile Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim programlarında 21. Yüzyıl bireylerinden beklenen davranışlar Tablo 2.’de verilmiştir.

Tablo 2. John Dewey’in demokratik yaşam felsefesine sahip bireylerin özellikleri ile Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim programlarında 21. Yüzyıl bireylerinden beklenen davranışlar

Demokratik Felsefesi	Yaşam	Türkiye	Yeni Zelanda
* Başkalarının düşüncelerine saygılıdır		* Bilgiyi üreten ve hayatta işlevsel olarak kullanabilen	* Başkalarının fikirlerine katılır ve katkıda bulunur
* Geçimlidir		* Eleştirel düşünen	* Kendine güvenir
* Önerilerde inisiyatifini kullanır		* Girişimci	* İletişim becerilerine sahiptir
* Görevinin bilincindedir		* Kararlı	* Başkalarıyla çalışır
* Sorumluluklarını yerine getirir		* İletişim becerilerine sahip	* Problem çözer
* Grup halinde çalışmaya isteklidir		* Problem çözebilen	* Bilgiyi işlemeyi bilir
* Anlayışlıdır		* Öz denetim sahibi	* Yaratıcı ve Yenilikçidir
* Çoğunluğun kararlarına uyar		* Empati yapabilen	* Dil ve sembolleri kullanır
		* Sorumluluk sahibi	* Kendi potansiyelini geliştirir
		* Topluma ve kültüre katkı sağlayan vb.	

Tablo 2 incelendiğinde John Dewey’in demokratik yaşam felsefesinde 8 madde bulunurken, Türkiye’nin adı geçen öğretim programında 10 tane davranış olduğu, Yeni Zelanda’nın adı geçen öğretim programında ise 9 tane davranış bulunduğu sonucuna ulaşılmaktadır.

Bu kısımda işaret edilen davranışlar arasındaki benzerliklerin tespiti için araştırma amacıyla belirtilen sorulara cevaplar aranmış ve yapılan analiz sonucunda elde edilen bulgular tablolar halinde sunulmuştur.

Tablo 3. John Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri ve Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim programlarında 21.Yüzyıl bireylerinden beklenen davranışların ima yönünden benzerlikleri

Demokratik Yaşam Felsefesi	Türkiye	Yeni Zelanda	İma Edilen Kavram
*Başkalarının düşüncelerine saygılıdır	*Empati yapabilme	-	*Farklı fikirlere saygı
*Önerilerde inisiyatifini kullanır	*Özdenetim sahibi *Eleştirel düşünen	*Kendine güvenir	*Özgüven
*Grup halinde çalışmaya isteklidir	*İletişim becerilerine sahip	-	*İletişim
*Görevinin bilincindedir	-	*Problem çözer	*Sorumluluk
*Geçimlidir	*İletişim becerilerine sahiptir	*İletişim becerilerine sahiptir	*İletişim
*Anlayışlıdır	*Bilgiyi üreten ve hayatta işlevsel olarak kullanabilen	*Bilgiyi işlemeyi bilir	*Üretici/üreten birey olma
*Sorumluluklarını yerine getirir	*Kararlı	*Yaratıcı ve Yenilikçidir	*Girişimci
*Çoğunluğun kararlarına uyar	*Topluma ve kültüre katkı sağlayan vb.	-	*Demokratik düşünme becerisi

Tablo 3 incelendiğinde Türkiye'de 8 davranış Yeni Zelanda'da 5 davranış ima etme durumu açısından John Dewey'in yaşam felsefesi ile benzerlik göstermektedir.

Bu benzerlikler John Dewey'in yaşam felsefesindeki;

- "Başkalarının düşüncelerine saygılıdır" maddesi ile Türkiye'de "Empati yapabilme" ifadesi, ima yönünden benzerdir ve ima edilen kavram "farklı fikirlere saygı" şeklindedir.
- "Önerilerde inisiyatifini kullanır" maddesi ile Yeni Zelanda'da "kendine güvenir" ifadesi Türkiye'de ise "özdenetim sahibi" ve "eleştirel düşünen" ifadeleri ima yönünden benzerlik içermektedir ve "özgüven" kavramı ima edilmektedir.
- "Grup halinde çalışmaya isteklidir" maddesi ile Türkiye'de "İletişim becerilerine sahip" ifadesi, ima yönünden benzerdir ve "iletişim" kavramı ima edilmektedir.
- "Görevinin bilincindedir" maddesi ile Yeni Zelanda'da "problem çözer" ifadesi, ima yönünden benzerdir ve "sorumluluk" kavramı ima edilmektedir.
- "Geçimlidir" maddesi ile Türkiye'de ve Yeni Zelanda'da bulunan "İletişim becerilerine sahiptir" ifadesi, ima yönünden benzerdir ve "iletişim" kavramı ima edilmektedir.
- "Anlayışlıdır" maddesi ile Yeni Zelanda'da "Bilgiyi işlemeyi bilir" ifadesi ve Türkiye'de "Bilgiyi üreten ve hayatta işlevsel olarak kullanabilen" ifadesi, ima yönünden benzerlik içermektedir ve "üretici/üreten birey olma" kavramı ima edilmektedir.
- "Sorumluluklarını yerine getirir" maddesi ile Yeni Zelanda'da "Yaratıcı ve Yenilikçidir" ifadesi ve Türkiye'de "Kararlı" ifadesi, ima yönünden benzerdir ve "Girişimcilik" kavramı ima edilmektedir.
- "Çoğunluğun kararlarına uyar" maddesi ile Türkiye'de "Topluma ve kültüre katkı sağlayan vb." ifadesi, ima yönünden benzerdir ve "demokratik düşünme becerisi" ima edilmektedir.

Tablo 4. John Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri ve Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim programlarında 21.Yüzyıl bireylerinden beklenen davranışların ifade yönünden benzerlikleri

Demokratik Yaşam Felsefesi	Türkiye	Yeni Zelanda	İfade Edilen Kavram
*Başkalarının düşüncelerine saygılıdır	-	*Başkalarının fikirlerine katılır ve katkıda bulunur	*Başkalarının fikir ve düşüncelerine saygı
*Grup halinde çalışmaya isteklidir	-	*Başkalarıyla çalışır	*Başkaları (grup) ile çalışmak

Tablo 4 incelendiğinde Yeni Zelanda'da 2 davranış ifade etme durumu açısından John Dewey'in yaşam felsefesi ile benzerlik göstermekte iken Türkiye'de ifade etme durumu açısından benzer bir davranış bulunmamaktadır.

Bu benzerlikler John Dewey'in yaşam felsefesindeki;

- "Başkalarının düşüncelerine saygılıdır" ifadesi ile Yeni Zelanda'nın "başkalarının fikirlerine katılır ve katkıda bulunur" maddesi ifade yönünden benzerdir ve burada ifade edilen kavram "başkalarının fikir ve düşüncelerine saygı" şeklindedir.
- "Grup halinde çalışmaya isteklidir" ifadesi ile Yeni Zelanda'da "Başkalarıyla çalışır" maddesi ifade yönünden benzerdir ve burada ifade edilen kavram "Başkaları (grup) ile çalışmak" biçimindedir.

Tablo 5. John Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri ve Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim programlarında 21.Yüzyıl bireylerinden beklenen davranışların vurgu yönünden benzerlikleri

Demokratik Yaşam Felsefesi	Türkiye	Yeni Zelanda	Vurgulanan Kavramlar
*Çoğunluğun kararlarına uyar	-	*Başkalarının fikirlerine katılır ve katkıda bulunur	*Farklı fikirlere saygı/uyum
*Görevinin bilincindedir	*Sorumluluk sahibi	-	*Görev ve Sorumluluk

Tablo 5 incelendiğinde Türkiye ve Yeni Zelanda'da birer davranış vurgulama durumu açısından John Dewey'in yaşam felsefesi ile benzerlik göstermektedir.

Bu benzerlikler John Dewey'in yaşam felsefesindeki;

- "Çoğunluğun kararlarına uyar" ifadesi ile Yeni Zelanda'da "Başkalarının fikirlerine katılır ve katkıda bulunur" ifadesi vurgu yönünden benzerdir ve bu ifadelerde "Farklı fikirlere saygı/uyum" kavramı vurgulanmaktadır.
- "Görevinin bilincindedir" ifadesi ile Türkiye'de "Sorumluluk sahibi" ifadesi vurgu yönünden benzerdir ve bu ifadelerde "Görev ve Sorumluluk" kavramları vurgulanmaktadır.

TARTIŞMA VE SONUÇLAR

Türkiye ve Yeni Zelanda Fen Bilimleri Dersi Öğretim Programlarında bulunan 21.Yüzyıl bireylerinden beklenen davranışlar ile John Dewey'in demokratik yaşam felsefesine sahip

bireylerin özellikleri vurgu, ifade ve ima benzerlikleri yönünden incelendiğinde aşağıdaki sonuçlara ulaşılmıştır.

Adı geçen ülkelerin ifade edilen programlarında 21.Yüzyıl bireylerinden beklenen davranışlar ile John Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri kısmen vurgu, ifade ima yönünden benzer oldukları tespit edilmiştir

Başka bir deyişle, Türkiye ve Yeni Zelanda'da mevcut ifadelerin kısmen yaşam felsefesi ile benzerlik (ima, ifade, vurgu) gösterdiği sonucuna ulaşılmıştır. Bu çalışmada bireylere demokratik davranışların hangi başlıklar altında verildiği incelenmiştir. İnceleme sonucunda eğitim sistemimizin temelini oluşturan John Dewey'in görüşlerinin beklenen düzeyde eğitime entegre edildiği sonucuna ulaşılmıştır, ancak Türkiye demokratik haklar ve kişisel özgürlükler bağlamında gelişmiş ülkeler arasında değildir. Benzer şekilde bu demokratik davranışların Yeni Zelanda eğitiminde de yer aldığı görülmektedir ve Yeni Zelanda öğretim programlarında "eğitim sistemimiz farklı ve eşsiz toplumumuzu yansıtmaktadır" (YKI, 2017) vurgusu yapılmaktadır. Benzer şekilde "müfredatların, öğretmenlere mesleki bilgilerinin uygulama esnekliği sağlayacak şekilde hazırlandığı ve öğrenmenin ihtiyaca göre kişiselleştirilebileceği" ifadesine de yer verilmektedir. Bu ifadelerden Yeni Zelanda eğitim sisteminin esnek bir yapıya sahip olduğu ve bu esnek yapıda eğitim alan bireylerin daha uzlaşmacı, demokratik ve farklılıklara saygı duyan bir toplumu oluşturdukları düşünülebilir.

Bu kapsamda, adı geçen ülkelerin ifade edilen programlarında bulunan 21.Yüzyıl bireylerinden beklenen davranışlar ile Dewey'in demokratik yaşam felsefesine sahip bireylerin özelliklerine benzerlikler (ifade, vurgu, ima) yönünden bakılmış ve bunlar ilgili alanyazın ile desteklenmiştir. Bu destekler şu şekildedir;

Dewey'in "Başkalarının düşüncelerine saygılıdır" maddesi ile Yeni Zelanda'nın adı geçen programında bulunan davranış ifade yönünden benzerlik gösterirken, Türkiye'nin işaret edilen programında bulunan davranış ima yönünden benzerdir. Dewey'in yukarıda sunulan maddesi, Roth (2001) tarafından "çocukların demokratik vatandaş olarak yetiştikleri farklı fikir ve kültürlere saygı duyan bireyler olmaları ve karşılaşılan bir probleme uzlaşmacı bir tavırla yaklaşmaları için okullarda ders ve ders arası tüm ortamlar bu konuların anlaşılması için meşrulaştırılmalıdır." şeklinde ifade edilmiştir. Dewey'in "Önerilerde inisiyatifini kullanır" maddesi ile adı geçen ülkelerin belirtilen programlarındaki işaret edilen davranışlar ima yönünden benzerlikler göstermektedir. Dewey'in yukarıda verilen maddesi, Tezci ve Gürol (2003) tarafından "öğretmenin öğrenci öğrenmesini sağlamak yerine öğrenenlerin kendi kişisel inisiyatiflerini kullanmaları için onları desteklemesi ve onlara yardımcı olması gerekliliğini vurgulayan ve böylelikle öğrenme çevresinin esneklik kazanacağını belirten" biçiminde ifade edilmiştir. Dewey'in "Grup halinde çalışmaya isteklidir" maddesi ile Yeni Zelanda'nın adı geçen programında bulunan davranış ifade yönünden benzerlik gösterirken, Türkiye'nin işaret edilen programında bulunan davranış ima yönünden benzerdir. Dewey'in yukarıda ifade edilen maddesi, Baumberger-Henry (2005), Hazne ve Berger (2007), Shachar ve Fischer (2004), Theodora (2001) taraflarından "işbirliğine dayalı öğrenme, öğrenenin hem akademik başarısını artırmakta hem de motivasyonlarını olumlu yönde etkilemektedir." şeklinde ifade edilmiştir.

Dewey'in "Görevinin bilincindedir" maddesi ile Yeni Zelanda'nın adı geçen programında bulunan davranış ima yönünden benzerlik gösterirken, Türkiye'nin ifade edilen programında bulunan davranış vurgu yönünden benzerdir. Dewey'in yukarıda işaret edilen maddesi, Gündüz (2018) tarafından "Sorumluluk sahibi olmak, görev bilinci geliştirmek ve problem çözmek gibi beceriler

değerler eğitiminin en önemli unsurlarındandır ve değerler eğitimi ailede başlar. Okullar ebeveynler ile işbirliği yaparak ifade edilen eğitimlerin gelişmesi için projeler gerçekleştirmelidir" biçiminde ifade edilmiştir.

Dewey'in "Geçimlidir" maddesi ile adı geçen ülkelerin belirtilen programlarındaki işaret edilen davranışlar ima yönünden benzerdir. Dewey'in yukarıda belirtilen maddesinin, başka bir deyişle bu becerilerin kazandırılmasında, Karagöz ve Dilek (2018) tarafından "okul ve aileler işbirliği içinde olmalıdırlar." şeklinde belirtilmiştir. Dewey'in "Çoğunluğun kararlarına uyar" maddesi ile Yeni Zelanda'nın adı geçen programında bulunan davranış vurgu yönünden benzerlik gösterirken, Türkiye'nin ifade edilen programında bulunan davranış ima yönünden benzerdir. Dewey'in yukarıda ifade edilen maddesi, Hotaman (2010) tarafından "toplumsal yaşam açısından demokrasi bir yaşam felsefesi ve bir yaşam biçimidir." biçiminde ifade edilmiştir. Dewey'in "Anlayışlıdır" maddesi ile adı geçen ülkelerin belirtilen programlarındaki işaret edilen davranışlar ima yönünden benzerdir. Dewey'in yukarıda belirtilen maddesi, Çiftci (2018) tarafından "iyi olmaktan ziyade sevgi, vicdan, ilgi, hoşgörü, anlayışın yanı sıra adalet kavramları ile üleştirilmektedir." şeklinde belirtilmiştir. İfade edilen bu kavramlar ise demokratik toplumların özelliği niteliğindedir (Dewey,1938).

Dewey'in "Sorumluluklarını yerine getirir maddesi" ile adı geçen ülkelerin belirtilen programlarındaki ifade edilen davranışlar ima yönünden benzerdir. Dewey'in yukarıda ifade edilen maddesi, girişimcilik ifadesi ile de benzerlik göstermektedir. Şenel ve Kocaalan (2018) tarafından "girişimcilik; işsizliğin azaltılması, istihdamın artırılması, gelir dağılımının düzenlenmesi ve refah artışının sağlanması gibi özellikleri karşılamaktadır" biçiminde ifade edilmiştir.

ÖNERİLER

Araştırmada, her iki ülkenin adı geçen öğretim programlarındaki 21.Yüzyıl bireylerinden beklenen davranışlar ile Dewey'in demokratik yaşam felsefesine sahip bireylerin özellikleri, ima, ifade, vurgu benzerlikleri yönünden incelenmiştir. Bu araştırmalar doğrultusunda elde edilen bulguları, diğer gelişmekte ve gelişmiş olan ülkelerin program geliştiricilerinin kullanabilecekleri önerilebilir.

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EXTENDED SUMMARY

Purpose

The aim of this study is to examine the characteristics of individuals who adopted John Dewey's democratic culture as a life philosophy and expected behaviors of individuals in Science Curricula in New Zealand and Turkey in terms of similarity.

In the countries indicated, the citizens have different religions and ethnic origins and speak more than one language. These differences constitute the cultural richness of these countries and increase the need for democracy. Turkey is a developing country in terms of democratic rights and personal individual freedoms and right to elect and be elected. New Zealand is among the most developed countries on these issues (socialprogress.org [SPI], 2018).

Analysis of a developing country and a developed country's curriculum in terms of the above mentioned characteristics, can bring about some suggestions on how the developing country should follow the path of democracy education.

Method

In this research, document review model was used. Turkey and New Zealand Science Curricula were used as the data collection tools and John Dewey's book Democracy in School Administration was also benefited from. Written sources on official websites of relevant institutions and organizations were used in order to reach the Science Curriculum. For data analysis, it was compared the expected behaviors from individuals in Science Curricula in New Zealand and in Turkey with the characteristics of individuals who adopted John Dewey's democratic culture as a life philosophy in terms of similarity. These comparisons were made in terms of expression, emphasis and implication. These are described by Yıldırım (2015) as,

- Implication; indirect speech, stating implicitly.
- Emphasis; in linguistics, drawing attention to the idea, which is continuously put forward and mentioned in an article or speech, stating a specific point by underlining it.
- Expression; saying, way of speaking or narration.

In the guidance of these definitions; when compared, the researcher (one) and the science education experts (three) were found to have similarities from each other independently. These similarities are classified as common and non-common opinions for the reliability of the study. The reliability of the obtained opinions was calculated evaluated as 0.75 using the reliability coefficient calculation formula. The finding of the result at 0.70 and above provides the reliability of the research (Miles and Huberman, 1994). As such, the obtained results can be reliably expressed.

Results

Turkey and New Zealand have reached the conclusion that the current expressions showed similarities with the life philosophy.

These similarities are as follows:

John Dewey's expression;

- While the title respectful to other's thoughts has similarities in terms of expression with the expression of New Zealand agrees and contributes to others' ideas In Turkey there is a similar connotation in terms of implication (empathy)
- uses his/her own initiative in suggestions, is similar in terms of connotation, with Turkey's expressions self-confidence and critical thinking and New Zealand's (self-confidence) in terms of implication
- willing to work in group is similar in terms of expression with New Zealand's expression (works with others), while there is a similar connotation (with communication skills) in Turkey in terms of implication.
- While the expression 'aware of his/her duty' is similar in terms of connotation with problem solving in New Zealand There is a similar expression in terms of stress in Turkey (responsible).
- He/she compatible is similar in terms of stress with the expression (who have the communication skills) in New Zealand and Turkey.

- complies with majority decisions is similar in terms of stress with New Zealand's expression of agrees and contributes to the others' ideas others there is a similar expression in Turkey in terms of connotation Who contributes to society and culture.
- insightful is similar in terms of connotation with the expression in New Zealand and Turkey (knows information processing, produces knowledge and is able to use functionally in life)
- fulfills its responsibilities is similar in terms of connotation with the expression in Turkey and New Zealand (stable, creative and innovative).

Discussion, Conclusion

In this study, the expected behaviors in the curricula of New Zealand and Turkey and the characteristics of the individuals who have adopted John Dewey's democratic culture as life philosophy were compared in terms of similarities. In Turkey and New Zealand has been reached the conclusion that the current expressions showed similarity (implication, expression, emphasis) with the philosophy of life.

The experiences of individuals throughout life, their roles in society and their education affect their perspective on life. In this context, the roles we expect from our students will guide them in their future lives. How much opportunities are given to them in schools for these roles? When we look at the literature, there are many suggestions regarding the transfer of democracy education to the class, but some teachers do not attach enough importance to this education due to the problems of curriculum completion on due time (Keskin and Sahin,2018). For this reason, schools have become institutions limited to provide academic information rather than being preparation for life or life itself. Democracy is an unavoidable reality in multinational countries like Turkey. In this study, it was examined which democratic behaviors were given to the students. As a result of the examination, it is concluded that the views of John Dewey who is the basis of our education system are integrated into the education system at the expected level. Nevertheless, Turkey is not among the developed countries in the context of democratic rights and personal freedoms. Ministry of National Education in New Zealand is emphasizing "Our education system reflects our unique and diverse society" and "We welcome different abilities, religious beliefs, ethnic groups, income levels and ideas about teaching and learning." (YKI,2017). As a result of these emphasizes, The New Zealand education system has a flexible structure and the people who receive this flexible education are more conciliatory, democratic and create a society that respects differences. In order similar expression be realized in Turkey, it is necessary the schools should be institutions that contribute to academic achievement and students should be educated as a democratic citizen, respect different ideas and cultures and approach a probable problem in a conciliatory manner.