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# LET'S EAT HEALTHY WITH DIGITAL GAMES!

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**Abstract:**
Nutrition is a health component that has an important place in our daily life and health. Healthy nutrition is associated with healthy lifestyle behaviors and represents a healthy lifestyle. Therefore, healthy eating is an important issue that should be promoted. In this direction, the promotion and development of healthy nutrition education programs are of an important dimension. The aim of this study is to investigate the effects of digital games on the nutrition awareness of elementary school students. In the study, various digital health games were applied for 15 weeks. The pattern of the study is qualitative. 12 elementary school students participated in the study. In the study, a semi-structured interview was used as a data collection tool. Content analysis was used in the analysis of the data obtained from the study. It was found that the students gave correct information about balanced nutrition and its importance after the application, classified the food groups correctly and gave various correct examples. As a result of the study, it has been reached that the nutrition education performed on digital games has a positive effect on the nutrition awareness of the students.

**Keywords**: nutrition, health education, digital game, awareness

## 1. Introduction

Nutrition is a health component that has an important place in our daily life and health. Healthy nutrition is closely related to healthy lifestyle behaviors (DeSmet et al., 2015). Nutritional disorders such as childhood obesity, which are prominent in children today,

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trigger adult obesity and therefore lifelong health risks. It determines both the health and education of the child and, accordingly, the quality of life (Schwimmer et al., 2003). It is important to distinguish food options and make healthy alternative choices in the prevention of nutritional disorders such as obesity. In the nutrition programs carried out in schools, solutions and materials are offered for wrong menu selection and bad eating habits that can cause obesity (Blasingame, 2017). In the study by McHugh et al. (2019), it stated students who receive school health education have a good knowledge of the components of a healthy lifestyle and the importance of health for the future.

School nutrition programs are designed and developed at various grade levels. The main topics examined in nutrition education programs are as follows (Gousiou & Kordaki, 2016).

- Classification of basic food groups (carbohydrates, fats, proteins, vitamins, minerals);
- The function of nutrients in the human body;
- Classification of foods as healthy/unhealthy;
- Chemical risks in food consumption (heavy metals, pesticides, toxic substances and industrial poison);
- Reading food labels and logos;
- Food safety and its importance;
- Food hygiene and its importance as stated.

The fact that healthy habits are not permanent in children and adolescents requires changes in the strategies applied in health education. Digital approaches suitable for today's education understanding are integrated into school nutrition programs (Consorti et al., 2012; Chuang & Tsao, 2013). Digital games can provide awareness and development about healthy nutrition and its importance by encouraging active participation and learning by having fun (Kurtzman et al., 2018). Digital games are interactive learning environments that appeal to many senses. Students are active and feel motivated while learning with digital games (Sera & Wheeler, 2017; Klassen et al., 2018). At this point, digital games can be useful educational tools that enable healthy behaviors to be placed in a fun way. Digital health games are designed for the adoption and sustainability of a healthy lifestyle (Roche et al., 2018).

Today, digital games have become an integral part of children's daily lives (Van Eck, 2015). In a study conducted in the USA, it was found that children spend more than 6 hours a day in front of the screen, and children prefer information sources such as television and computers much more than information sources such as books and magazines (Assadourian, 2016). Digital games appealing to the young population can be an effective method for creating healthy lifestyle changes and habits (Kostenius et al., 2018; Rohde et al., 2019). On the other hand, considering that food preferences are determined in the early stages of life, unhealthy choice behaviors established in childhood can turn into habits and adversely affect later periods (Mayo, 2008). In this study, primary school students were chosen to represent a small age group for nutrition education and digital games that might interest them were used. The research problem

of the study is "How is the effect of nutrition education given with digital games on students' nutrition awareness?" determined as.

## 2. Literature review

When literature is examined, Grimes et al. (2010) developed a game in which players learn to make healthy food choices. Thanks to the game developed in the study, it was reached that the participants reviewed and made changes in their daily eating habits. Banghaei et al. (2016), a mobile Android game "Mario Brothers" was applied for children with diabetes. As a result of the pilot application carried out in the study, it was found that the children found the game remarkable and improved their knowledge about healthy eating. Bailey et al. (2020), an educational digital game called FoodKnight was applied to teach healthy food choices. In the study, it was found that the general statement received from 38 participants was positive and the accessibility of the game was increased. In the study of Froome et al. (2020), the digital health game called "Foodbot Factory" was applied to 73 primary school students. The pattern of the study is quantitative. In the study, the scale was applied to the students. As a result of the study, it was found that there was a significant increase in the general nutrition knowledge (vegetable-fruit, protein foods, whole grains) of primary school students. In another study by Xu et al. (2022), the effect of consumer health awareness on consuming dairy products during the pandemic period was investigated. In the study, it was determined that the health awareness of consumers is related to the consumption of dairy products; it was found that if consumer health awareness is high, the purchase of dairy products is also high.

## 3. Study process

In this nutrition education study, educational digital games were applied to daily life eating habits and behaviors as different each week for 15 weeks. In every game, there are questions and scenarios about food groups, healthy menu and food selection, daily water drinking habits and healthy nutrition. Images of one of the implemented games are given below.


**Figure 1:** Separation of foods


**Figure 2:** Healthy menu choice

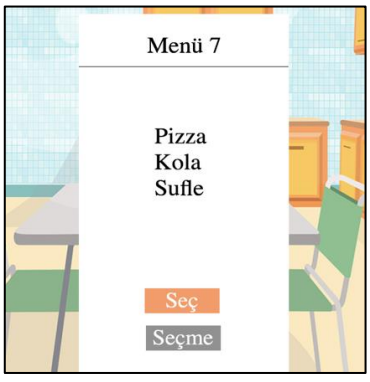


**Figure 3:** Unhealthy food choice

The games were implemented as 2 lesson hours (40 minutes+40 minutes) each week. During the application, the students answered the questions while playing the game and proceeded according to the scenarios. When they give the wrong answer, they could not advance to the next level or lost the game. In this case, the researchers brainstormed with the students and directed them to the correct answer. After the games, questions and answers were made with the students and reinforcement was provided. Each week, the lesson was started by making an evaluation of the previous week.

## 4. Method

### 4.1 Study model

In the study, it was aimed to examine the awareness of students towards nutrition in more detail. For this reason, the model used is phenomenology, which is a qualitative research model. The purpose of phenomenological studies; it is to examine more deeply how participants make sense of their experiences and to contribute to their understanding (Starks and Trinidad, 2007).

### 4.2 Study group

The study sample consists of 12 primary students. Students are studying in the 4th grade (9-10 years age) and of these students, 10 (83.33%) are boy and 2 (16.66%) are girls students. The criterion sampling method was used in the selection of the sample. Accordingly, in the selection of the study group, it was taken into account that the students were interested in digital games, had a computer or tablet, and were volunteers. In this method, inclusion and exclusion criteria are determined by the researchers before the study and the study group that meets these criteria is selected accordingly (Suri, 2011).

### 4.3 Data collection tools

In the study, a semi-structured interview was used as a data collection tool. In semi-structured interviews, pre-prepared questions are asked with the participants and their opinions are taken. During the interview, new questions are added if necessary, and the interview continues and then is completed (Kallio et al., 2016).

### 4.4 Data analysis

Content analysis was applied in this study. The data obtained in the content analysis are evaluated and interpreted as codes, themes and categories (Stemler, 2015). In order to ensure the validity and reliability of the study, the data obtained were analyzed together by the researchers and the percentage of agreement was found to be 88.00%. In addition, long-term interaction was carried out and the study is described in detail (Bogdan and Biklen, 2007).

## 5. Results

The answers given by the students to the question before and after the implementation are given in tables.

**Question 1:** What is a balanced diet?

The answers given by the students to the 1st question are given in Table 1.

**Table 1:** Students' codes question of "What is a balanced diet?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| Not to eat fatty foods | S1 | |
| Not eating junk food | S2, S7, S8, S9, S10, S12 | |
| Eating 3 meals | S5, S6, S11 | S5, S8 |
| To eat enough from each food group | | S1, S2, S3, S4, S6, S7, S9, S10, S11, S12 |

When Table 1 is examined, it is seen that the students could not define the balanced diet correctly before the application. While the majority of the students associate balanced nutrition with not consuming more harmful foods before the implementation, it is reached that they made the correct definition after the implementation.

An example of an answer given before the implementation:

*"A balanced diet means not eating junk food. These foods are harmful to our health, if we do not eat them, we will have a balanced diet."* (S2, boy).

**Question 2:** How many groups are foods divided into? What are the names of the groups?

The answers given by the students to the 2nd question are given in Table 2.

**Table 2:** Students' codes "How many groups are foods divided into? What are the names of the groups?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| I do not know | S1, S5, S6, S7, S8, S9, S12 | |
| 1-4 groups | S2, S3, S10, S11 | |
| No group | S4 | |
| 5 groups | | S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12 |

When Table 2 is examined, it is seen that the students did not know the number of food groups before the implementation. After the implementation, it was found that all of the students expressed the number of food groups exactly. "It is divided into five groups: carbohydrate, protein, fat, mineral, vitamin". After the implementation, all of the students classified the number and names of food groups correctly.

An example of an answer given before the implementation:

*"I think there is no general and specific group of foods. Everyone eats different foods."* (S4, boy).

**Question 3:** Which foods are in the carbohydrate class?

The answers given by the students to the 3rd question are given in Table 3.

**Table 3:** Students' codes question of "Which foods are in the carbohydrate class?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| Bread | S1,S2,S3,S4,S5,S8,S10,S12 | S1,S2,S3,S4,S5,S6,S7,S8,S9,S10,S11,S12 |
| Pasta | S3,S10 | S3,S4,S5,S8,S10,S11,S12 |
| Pizza | S10 | S2,S7,S9,S10 |
| Pastry | S3,S10 | S2,S3,S5,S6, S7,S10,S11 |
| Potato | | S1,S3,S4,S8,S11,S12 |
| Rice | | S3,S5,S6,S8,S9,S10 |

When Table 3 is examined, it is seen that the students added extra examples after the implementation to the carbohydrate samples they gave before the implementation.

**Question 4:** Which foods are in the protein class?

The answers given by the students to the 4th question are given in Table 4.

**Table 4:** Students' codes question of "Which foods are in the protein class?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| I do not know | S1, S2, S3, S5, S6, S9, S11, S12 | |
| Meat | S8 | S1, S2, S3, S4, S5, S8, S9, S10, S11, S12 |
| Egg | S8, S10 | S3, S4, S5, S6, S8, S10, S11, S12 |
| Milk | | S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12 |
| Chicken | | S5 |
| Buttermilk | | S3, S8, S12 |
| Fish | | S2, S5, S7, S8, S10 |

When Table 4 is examined, it is seen that the students added extra samples after the implementation to the protein samples they gave before the implementation.

**Question 5:** "Which foods are in the oil class?"

The answers given by the students to the 5th question are given in Table 5.

**Table 5:** Students' codes question of "Which foods are in the oil class?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| I do not know | S1, S2, S4, S6, S8, S9, S10 | |
| Olive oil | S3, S11 | S1, S2, S3, S6, S7, S8, S9, S10, S11, S12 |
| Sunflower oil | S11 | S2, S4, S5, S6, S7, S8, S11, S12 |
| Fish oil | | S4, S7 |

| | | |
|---|---|---|
| Nuts | | S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12 |

When Table 5 is examined, it is seen that the majority of the students could not give oil samples before the implementation. After the implementation, it was found that all of the students gave the correct oil samples.

**Question 6:** Which foods are in the vitamin class?

The answers given by the students to the 6th question are given in Table 6.

**Table 6:** Students' codes question of "Which foods are in the vitamin class?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| Citrus | S1 | |
| Fruits | S2, S5, S6, S7, S8, S11, S12 | S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12 |
| I do not know | S3, S4, S9, S10 | |
| Vegetables | | S1, S2, S4, S5, S7, S8, S10, S11 |

When Table 6 is examined, it is seen that the majority of the students gave the answer "Fruits" before the implementation; after the implementation, it is reached that all of the students answered.

**Question 7:** What should be on a healthy menu?

The answers given by the students to the 7th question are given in Table 7.

**Table 7:** Students' codes question of "What should be on a healthy menu?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| I do not know | S1, S3, S4, S6, S7, S9, S10, S11 | |
| Varies by meal | S2, S12 | |
| All food must be | S5, S8 | S1, S12 |
| All food groups should be | | S2, S3, S4, S5, S6, S7, S8, S9, S10, S11 |

When Table 7 is examined, most of the students could not answer the question. After the implementation, the majority of the students answered the question "All food groups should be" correctly.

An example of an answer given after the implementation:

While students cannot specify a sample menu before the implementation, sample menus can be expressed after the implementation.

> *"As a dinner, I think meat, salad, potato, watermelon can be. Carbohydrate, protein, fat, mineral, vitamin should be."* (S9, boy)

**Question 8:** What could happen if we don't pay attention to our diet?

The answers given by the students to the 8th question are given in Table 8.

**Table 8:** Students' codes question of "What could happen if we don't pay attention to our diet?" in before and after implementation

| Codes | Before | After |
|---|---|---|
| We can be obese | S1, S6 | S1, S3, S5, S6, S7, S9, S10, S11, S12 |
| I do not know | S2, S3, S7, S8, S12 | |
| We experience health problems | S9, S11 | S2, S4, S8, S10 |
| We are weak | S10 | S3, S5, S9 |

When Table 8 is examined, it is seen that the students did not know the question before the implementation; after the implementation, the answer was "We can be obese" the most.

Before the implementation, one of the students (S9, boy) replied as "*We get sick quickly, we have shortness of breath*" before the implementation. Another student (S11, boy) replied as "*If we do not eat well, our body order will deteriorate, we will become weak and our energy will decrease*". These answers were coded as "We experience health problems".

## 6. Conclusion and discussion

This study aimed to investigate the effect of digital games on nutrition awareness of elementary school students. Participants gave true knowledge about balanced nutrition and its importance, classified the food groups correctly and gave various correct examples after the implementation. As a result of the study, it was found that the educational digital games implementation had a positive effect on the nutrition awareness of primary school students.

When the literature is examined, Yien et al. (2011), there was a significant increase in the nutrition learning of primary school students, to which the educational digital health game developed for nutrition education was applied. In the study by Fraticelli et al. (2016) with adolescents (17-21 years age), it was found that the digital health game significantly increased the participants' knowledge about healthy eating. In the study by Brown (2017), it was found that the "National Diabetes Prevention Program" implemented to improve awareness of diabetes improves diabetes knowledge and awareness in diabetes patients. In the study of Altammami (2017), it was found that the "Diet Coach One" mobile game application developed is effective in improving adolescents' awareness of nutrition. Mitchell et al. (2021), it has been determined that the developed digital game has positive effects on the health knowledge of undergraduate students.

In order to generalize the research, digital games can be applied to different education levels such as secondary school, high school and university. The duration of the study can be kept longer and different game sites can be used.

## Conflict of Interest Statement

The authors declare no conflicts of interest.

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