TURJE
www.turje.org
2024
Volume: 13 Issue: 5 (Special Issue)
Turkish Journal of Education

https://doi.org/10.19128/turje.1505099
Research Article
Received 26.06.2024
Accepted 16.09.2024

Scenario-based teaching process in the life science course based on socioscientific issues

Sema Öztürk
Ministry of National Education, Sivas, Türkiye, sema4858@gmail.com
Hamdi Karakaş
Sivas Cumhuriyet University, Department of Primary Education, Sivas, Türkiye, hamdikarakas58@yahoo.com.tr

ABSTRACT This study aims to determine the effect of scenario-based teaching based on socioscientific issues in the life science courses on decision-making skills, attitudes towards the course, and academic achievement of primary school students. The research was conducted during the life science course and scenario-based teaching activities in the context of socioscientific issues were implemented for 8 weeks. Pre-post and retention tests were used to measure the changes in decision-making skills, attitudes towards the life science course and academic achievement of primary school students. Based on the results of the study, the scenario-based teaching process implemented about socioscientific issues significantly increased primary school students' decision-making skills, their attitudes toward the life science course, and their academic achievement both during and at the end of the process a significantly broad effect ($p<.05$). Moreover, the difference between the mean scores was statistically significant ($p<.05$), with an average score of 30.53 in the first week and 47.95 in the last week from the alternative measurement tools included in the activity forms throughout the process. The process of scenario-based teaching process based on socioscientific issues, makes the course more relevant and accessible to students by integrating real-world problems into the learning process, which leads to an increase in their academic achievement. In this context, it is expected that this process will be used at different education levels (secondary school and high school).

Keywords: *Life science course, Primary school students, Scenario-based teaching, Socioscientific issues*

Hayat bilgisi dersinde sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretim süreci

ÖZ Çalışmanın amacı, hayat bilgisi dersinde sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretimin ilkokul öğrencilerinin karar verme becerilerine, derse yönelik tutumlarına ve akademik başarılarına etkisini belirlemektir. Araştırma hayat bilgisi dersi sürecinde gerçekleştirilmiş ve sosyobilimsel konular bağlamında senaryo temelli öğretim etkinlikleri 8 hafta boyunca uygulanmıştır. Ön-son ve kalıcılık testleriyle ilkokul öğrencilerinin karar verme becerileri, hayat bilgisi dersine yönelik tutumları ve akademik başarılarındaki değişimi ölçülmüştür. Aynı zamanda ders sürecinde senaryo formları kullanılarak grup etkinlikleri ile süreç tasarlanmış ve alternatif ölçme araçları ile süreç içeresinde ilkokul öğrencilerinin akademik başarıları ölçülmüştür. Araştırma sonucunda sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretim süreci ilkokul öğrencilerinin karar verme becerilerini, hayat bilgisi dersine yönelik tutumlarını ve hem süreç boyunca hem de süreç sonunda akademik başarılarını geniş etki ile anlamlı bir şekilde arttırdığı ($p<.05$) sonucuna ulaşılmıştır. Ayrıca süreç boyunca etkinlik formlarında yer alan alternatif ölçme araçlarından ilk hafta 30,53 ortalama puan alırlarken, son hafta 47,95 ortalama puan aldıkları görülerek ortalama puanlar arası farkın da istatiksel olarak anlamlı olduğu ($p<.05$) tespit edilmiştir. Sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretimin süreci, gerçek dünya sorunlarını öğrenme sürecine entegre ederek dersi öğrenciler için daha alakalı ve erişilebilir hale getirir, bu da onların akademik başarılarında artışa neden olmaktadır. Bu bağlamda düşünüldüğünde farklı öğretim kademelerinde de bu sürecin kullanılması beklenmektedir.

Anahtar Sözcükler: *Hayat bilgisi dersi, İlkokul öğrencileri, Senaryo temelli öğretim, Sosyobilimsel konular*

Citation: Öztürk, S., & Karakaş, H. (2024). Scenario-based teaching process in the life science course based on socioscientific issues [Special Issue]. *Turkish Journal of Education, 13*(5), 441-464. https://doi.org/10.19128/turje.1505099

INTRODUCTION

Scientific knowledge facilitates human life by leading to discoveries, yet it is also important that scientific knowledge is accepted by society and is open to discussion (Sadler, 2004). Whether the use of genetically modified organisms (GMOs) should be allowed, the exploration of different materials such as hydrocarbons in the seas should continue, or pollution from air transport should be taxed are issues related to science but debated by society (Bächtold et al., 2023). This raises the question of socioscientific issues (SSI) that highlight the contested dimension of science (Tomas et al., 2011). SSI are dichotomous themes that address both scientific and social issues together in content, requiring consideration of multiple factors such as moral, ethical, cultural, traditional, economic, political and environmental, as well as those that are grounded in science (Chang-Rundgren & Rundgren, 2010; Kumar et al., 2024; Yacoubian & Khishfe, 2018). These topics are of scientific content, include different views, and are socially and socially important (Atabey et al., 2018). This content of SSI provides the opportunity to analyze the benefits and harms, perceive scientific and social issues from diverse perspectives, and discuss ethical, scientific, political, and moral dimensions that concern society intimately (Topçu & Atabey, 2017). SSI may serve as a tool for raising individuals who can keep up with society's changing and developing nature, express their thoughts, access information, and make decisions on these issues since SSI entail the deliberate discussion of scientific topics across different contexts. The outcome of these discussions and decision-making processes is determined by the attitude, and ethical and moral judgments of the students (Zeidler & Nichols, 2009). This provides an opportunity for the individual to develop their understanding and thinking about social issues, science and the possible outcomes of scientific discovery (Tang et al., 2023).

Presentation, analysis, and discussion of SSI in the classroom enable students to make decisions and comparisons in the light of their scientific knowledge and to evaluate the arguments around them (Dawson & Carson, 2016). An SSI is expected to be well understood by individuals first, and then they should express their opinions about it. However, SSI often present students with facts on the one hand and complex problems or decisions on the other (Bögeholz & Barkmann, 2005). Discussing and making decisions about socioscientific issues is considered important for problem-solving, as these issues are open to interpretation and often involve ill-structured problems that students may encounter significantly in their lives. Socioscientific-based teaching approaches engage students in discussing the social aspects of science and encourage them to make informed decisions and actively contribute to society (Kokolaki & Stavrou, 2022). Since SSI are related to daily life, students may get involved in these issues depending on their interests (Stefanova et al., 2010). The Science Curriculum in the Turkish educational system aims to develop the skills to compare, judge, and think scientifically by using SSI (MoNE, 2018a). The Social Studies Curriculum is aimed at helping students solve the problems they encounter in life by using the basic concepts and methods of social sciences (MoNE, 2018b). The life Sciences courses form the basis of Science and Social Studies courses. The life science course has an active role in helping students acquire basic attitudes and skills. The Life Science course deals with natural and social facts and events, tries to prove the facts and events with facts, and covers the information obtained as a result (Sönmez, 1998). In this course, social elements are emphasized intensively and students are enabled to make connections between these elements and real life (Ütkür et al., 2016). The life science course provides opportunities for experiential learning where students develop their educational experiences and understanding of scientific concepts is promoted, and opportunities for experiential learning are provided. Therefore, teachers need to include activities that students will enjoy, have fun, and learn at the same time. This contributes to the development of students' intrinsic motivation to learn, which in turn may have a lasting impact on their engagement and academic achievement (Demirci, 2020; Eldowah & Alnajashi, 2017; Martini et al., 2021; Nordqvist & Aronsson, 2019).

The life science courses, on the other hand, form the basis of Science and Social Studies courses and provide important opportunities for SSI based activities at the student level from the first grades of primary school. Considering the specific objectives of the life science course, the main objectives are to enable students to learn to recognise the environment in which they live, to perceive problems in that environment, and to acquire the ability to learn basic science processing skills (MoNE, 2018c). In

different outcomes of the 2018 curriculum (e.g: *"L.S.2.6.3. Gives examples of the effects of natural elements in the immediate environment on human life"*, *"L.S.2.5.8. Observes production activities in the immediate environment"*, etc.) and in different learning outcomes and process components of the 2023 curriculum (e.g.: *"L.S.1.6.2. ask questions about technology"*, *"L.S.3.5.4. collect information from sources related to environmental sustainability"*, *"L.S.3.6.1. interpret the impact of scientific developments on daily life"*, etc.) of the life sciences course, connections are made with SSI topics (MoNE, 2018c; 2024a). However, according to the Life Science Course Curriculum published in 2024, assigning students tasks related to daily life and problems encountered in the immediate or distant environment was defined as a principle of practice. This curriculum proposes an interdisciplinary approach and teaching-learning practices which integrate "social-emotional learning skills", "literacy skills" and "values" in an efficient manner (MoNE, 2024a).

Although it is suggested that SSI should be used as a method, it is seen that activities that are disconnected from students' daily lives and that include hypothetical scenarios are often preferred. (Pedretti & Hodson, 1995). Therefore, presenting various SSI related to real life in a scenario at the student level can pave the way for the formation of the basic skills (information gathering, comparison, questioning, inference, reasoning, discussion, synthesis, analysis, logical control [MoNE, 2024b]) that students are expected to acquire from an early age. In the studies conducted on SSI, the use of these topics in the course process contributes to increasing students' scientific literacy levels, developing their metacognitive thinking skills and scientific reasoning skills (Ayaz & Bulut, 2022; Siew & Ahmad, 2023; Tidemand & Nielsen, 2016; Villarín & Fowler, 2019). The important contributions of socioscientific issues were taken into consideration. In this study, it was deemed important to use them in the life science course, which forms the basis of Science and Social Studies courses in primary schools and is directly related to life. In line with this importance, the researchers carried out scenario-based teaching activities in the context of socioscientific issues in the life science course. Accordingly, the research process was structured by envisioning that using socioscientific scenarios in the life science course would affect the decision-making skill, which is one of the skills expected to be gained by primary school students, would change their attitudes towards this course, and that this attitude would contribute to academic achievement. In addition, considering the insufficiency of studies conducted with primary school students in the context of socioscientific issues (Acer, 2022; Altay, 2022; Soydemir-Bor & Alkış-Küçükaydın, 2021), it was predicted that the use of SSI in primary school the life science lessons would contribute to the related literature.

Socioscientific Issues (SSI)

SSI are ambivalent and thus fraught with confusion and doubt. Students require the ability to discuss and compare SSI (Sadler et al., 2007). In implementing this, students are presented with real-life problems, and a discussion process is formed by using the scientific knowledge they have acquired (Dawson & Carson, 2016). Students are suddenly confronted with a variety of SSI with the development of technology. The use of SSI should be regarded as a crucial tool for students to reach conclusions by rational thinking about these issues that directly affect society (Sönmez & Kılınç, 2012). An important aspect of SSI is that it encourages students to reflect on their personal philosophies and belief systems that directly influence their decision-making processes. For example, students use their individual values and experiences in SSI scenarios to evaluate their beliefs in a structured way, and SSI serves as a platform for decision-making (Evagorou et al., 2012). Students need to consider SSI from different and broader perspectives during the courses. Individuals educated on SSI evaluate the moral, ethical, social, and psychological aspects of the decisions they make (Aydın & Karışan, 2021). It requires students to engage in complex reasoning processes that involve evaluating conflicting information, considering multiple perspectives and making informed choices based on their own values and beliefs. To achieve this, students are expected to be subjected to and experience situations involving the discussion of SSI in the classroom. The activities should incorporate higher-order thinking skills such as decision-making, comparison, and argumentation. Thus, students will have the opportunity to comprehend contrasting opinions about some SSI in a class, consider and evaluate these opinions, collect information from different sources to support their ideas, and make inferences by discussing them (Topçu, 2015).

An SSI-based activity process creates a more engaging and relevant learning environment by integrating real-world problems that intersect with scientific concepts. This relevance not only increases students' interest in the subject matter, but also promotes deeper cognitive engagement, leading to improved academic outcomes. Students who participated in SSI-based instruction reported higher levels of learning satisfaction and such approaches positively influenced their attitudes towards the course (Nuangchalerm & Kwuanthong, 2010). It has been reported that students who receive SSI-based instruction improve their ability to discuss ethical issues and negotiate scientific concepts in social contexts, leading to better academic performance (Wongsri & Nuangchalerm, 2010). This finding supports the finding that SSI-based activities contribute to critical thinking, decision-making and discussion skills as well as increase academic achievement (Tidemand & Nielsen, 2016). SSI-based education, which encourages critical thinking, ethical reasoning, decision-making skills, and a sense of social responsibility, improves academic outcomes and increases student engagement and satisfaction with the course. Therefore, integrating SSI into the life science courses is essential for raising informed and responsible citizens who are equipped to meet the challenges of the 21st century.

Scenario-Based Teaching

Scenarios are storytelling narratives that include events and people, adapted to reality or associated with true events (Carroll, 2000). Students activate multiple high-level thinking skills, such as analysis, evaluation, synthesis, decision-making, etc., while working with scenarios (Açıkgöz, 2007). Scenario-based teaching involves using scenarios that support effective learning techniques such as event-based, problem-based learning, etc. (Kocadağ, 2010). The actual case is represented in the classroom environment in scenario-based learning, and students think about the problem and relate it to real life. The scenario-based teaching method focuses on the student, associates basic skills with real life, contains active knowledge, increases motivation, prepares an environment for cooperative learning, and combines classes that are different in content with a random scenario (Filiz et al., 2005). Furthermore, individuals learn through scenarios and the ability to synthesize, synthesize decision-making skills, analyze and evaluate, and use higher-order thinking skills intensively (Açıkgöz, 2007; Chen, 2022; Tian & He, 2020).

Engaging with SSI helps students understand the different perspectives in social debates and makes the issues at hand more comprehensible (Saka, 2023). To achieve this, complex issues need to be scripted and students need to be able to make decisions on these scenarios. Thus, the structure of SSI can also provide a basis for scenario-based teaching. Because one of the key aspects of SSI is that it is inherently complex and students need to deal with uncertain situations (Özcan & Gücüm, 2021). SSI provides a theoretical framework for making sense of these complex problems and examining them from multiple perspectives (Dawson & Carson, 2016). This framework is well aligned with scenario-based teaching, where students are presented with realistic situations with no clear-cut solutions. By engaging with these scenarios, students develop arguments and learn to approach problems critically, essential for effective real-life decision-making.

It is argued that SSI is effective in preparing students to become informed citizens who can critically evaluate scientific knowledge and make evidence-based decisions (Eidin & Shwartz, 2023). This is in line with the goals of scenario-based learning, which aims to equip students with the necessary skills to tackle complex problems and make informed choices. This is because students' confrontation with real life situations can be realized through scenario-based teaching (Alptekin, 2012; Arabacıoğlu, 2012; Avcı & Bayrak, 2013). At the same time, scenario-based activities enable individuals to relate to situations, comment on them and apply concepts to real situations (Ergin et al., 2005). Since many topics in the life science courses are directly related to life, it was envisaged in this study that activities could be designed in the context of scenario-based teaching. In this design, different socioscientific issues formed the basis of scenario-based teaching.

Decision-Making Skills

Decision-making skills include a range of cognitive, emotional and social competencies that enable individuals to make informed choices in a variety of contexts. It enables individuals to set priorities, determine mental strategies and establish a connection between thought and action from an early age (Ellis, 2007). Bayraktaroğlu and Demir (2011) defined decision-making as the process of individuals thinking analytically to solve the problems they face, making a positive or negative judgment as a result of this thinking, and then choosing the most appropriate applicable, and most beneficial situation. Decision-making essentially involves the ability to identify problems, evaluate options, and choose a course of action based on available information and personal values. The decision-making process can be challenging for the individual and may lead to an even more complex and inextricable emotional state in solving a problem. Thus, decision-making skills are a key concept in education and training studies as they involve cognitive processes (Zeidler et al., 2005). These skills begin from the first grade of primary school and continue as daily life and basic skills (MoNE, 2018c).

One dimension of decision-making skills is cognitive processing, which includes critical thinking, problem-solving, and analytical abilities. Research suggests a strong relationship exists between critical thinking, problem-solving, metacognitive, and decision-making skills, and that individuals' activities aimed at these skills contribute to effective decision-making (Karim & Cheng, 2018). Educational interventions to improve reasoning processes in the classroom increase the potential to improve students' decision-making skills (Farae, 2020). However, effective decision-making often requires cooperation and communication with others, and social interaction environments positively affect decision-making skills (Lassoued et al., 2020). Teachers also should prepare and plan enriched environments for students, develop decision-making skills, and develop and organize activities that will enhance these skills (Çakmakçı, 2009). Thus, primary school education is one of the significant periods in which students acquire basic skills such as information gathering, questioning, reasoning, discussing, analyzing and synthesizing and develop scientific processing skills, and develop scientific processing abilities, and improvements need to be made in the educational environment (Jirout & Zimmerman, 2015; Osman, 2012). Activities that aid in solving social problems and help to look critically at events and situations in primary schools should be considered important in developing decision-making skills (Karahan et al., 2023). Activities based on SSI can also be considered as activities that can develop decision-making skills. Given the multidimensional nature of these issues, students engage in reasoning and decision-making processes about SSI by drawing on their personal experiences (Ladachart & Ladachart, 2021). Decision-making processes on SSI are essential for developing students' critical thinking and reasoning skills. Engaging with SSI allows students to confront real-world problems and thus develops their ability to analyze information, weigh evidence and consider multiple perspectives. Related literature shows that when students engage in discussions on SSI, they learn not only to express their own perspectives but also to critically evaluate the arguments of others, thereby providing a deeper understanding of existing situations and preparing students to make informed decisions that reflect both scientific understanding and ethical considerations (Agell et al., 2014; Garrecht et al., 2018; Laius et al., 2016; Rahayu, 2024; Zeidler et al., 2019). This interaction with SSI helps students to feel competent to participate in social debates involving science and contributes to the development of decision-making skills (Ottander & Simon, 2021). By incorporating SSI into the learning process, students' ability to interpret scientific knowledge and apply it to real-life situations is improved, thus enhancing their decision-making abilities (Ardwiyanti & Prasetyo, 2021; Fadha, 2023). Therefore, SSI-based decision-making competence is considered important in the Global Age, and it is argued that activities based on SSI should be carried out in order to equip future citizens with this competence (Betul-Cebesoy & Chang Rundgren, 2021).

The Purpose of the Study

This study aims to determine the effect of scenario-based teaching based on SSI in the life science courses on decision-making skills, attitudes towards the course, and academic achievement of primary school students. Answers to the following questions will be sought in this context:

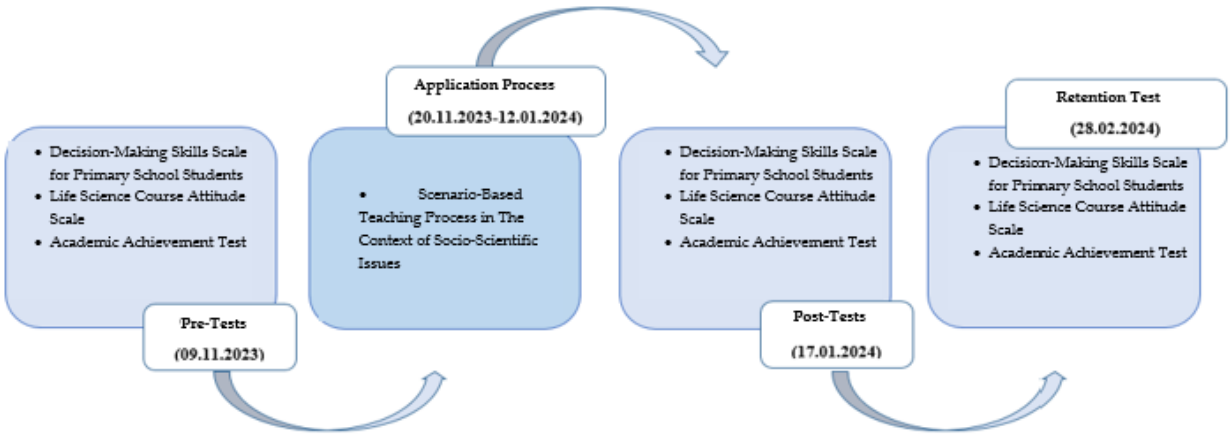
1. What is the effect of scenario-based teaching on the decision-making skills of primary school students based on SSI?
2. What is the effect of scenario-based teaching based on SSI on primary school students' attitudes towards the life science courses?
3. What is the effect of scenario-based teaching based on SSI on the academic achievement of primary school students?

METHOD

Study Model

The study was designed as a quantitative study and with an experimental design. In experimental designs, one or more independent variables are manipulated while controlling for other factors that may affect the results. It is then determined to what extent changes in the independent variable can directly affect the dependent variable. In experimental designs, researchers use techniques such as randomization, blinding, and adding control groups to minimize errors and demonstrate that the observed effects are due to experimental manipulation rather than other factors (Collins & Tabak, 2014; Johnson & Besselsen, 2002). Depending on the purpose of this study, the researchers planned an experimental design process by creating an experimental and control group by controlling other factors. However, a control group could not be formed because one of the researchers was working as a teacher in primary school, already had a study group, and there were no different class sections in this school. Viza et al. (2015) state that a one-group weak experimental design can be used in these cases. In this context, a one-group weak experimental process was designed in the study and the process is presented in Figure 1:

Figure 1.
Research Model



Pre and post-tests were performed to measure the changes in decision-making skills, attitudes towards the life science courses, and academic achievement of primary school students before and after the activities organized in the life science course. In the procedural phase, scenario-based teaching activities based on SSI were implemented for eight weeks alongside the course content. Scenario forms were used during this phase. In addition, to assess the persistence of the process, the same data collection tools were re-presented to the students and administered as a retention test. The data obtained from the primary school students, including the scores they received from the activity forms during the eight weeks, were analyzed and interpreted.

Study Group

Two different sampling methods were applied for the experimental process and the pilot application of the academic achievement test (AAT). The convenience sampling method was used to determine the study group for the experimental process. The fact that one of the researchers was working as a teacher in a primary school and already had his own classroom enabled him to choose convenience sampling in the experimental process. Accordingly, the study included 19 second-grade students from a primary school in Central Anatolia, with 10 female and 9 male participants.

In the pilot implementation of the AAT reliability test, different criteria were determined by using the criterion sampling method. These criteria were determined as being at the same age and level as the study group and having prior knowledge about the questions in the test by taking the life science course before. The life science courses are taught in the first, second and third grades of primary school. However, the first grade level of primary school is a period in which both the reading and writing process is learned for the first time and students encounter the life science topics for the first time. For this reason, first-grade students were not included in the pilot study because it was thought that their knowledge of the life science course was not yet sufficient and they were not at a level to answer the questions of the test adequately. Second and third grade students were determined as the sample group in the pilot study because they had taken this course before and were able to answer the questions in the test and they were at the same age and level as the study group. Accordingly, 202 elementary school students attending the second and third grades of a primary school in a province located in the Central Anatolia Region were included in the pilot study.

Implementation Process

Before the implementation process, the researcher examined the Life Science Curriculum. Following this review, the subjects and outcomes in which students can use their decision-making skills for scenario-based teaching were identified. The researcher paid particular attention that these outcomes are particularly relevant to SSI, that the nature of these issues includes real-life problems based on environment, technology, and health issues, and that there are dichotomous situations. Thus, acquisitions from five units in the second-grade the life science curriculum (Life in Our Home, Healthy Life, Safe Life, Life in Our Country, Life in Nature) that could be used to create socioscientific topics were included in the implementation process. Scenarios were prepared following the identified topics and learning outcomes, and forms with alternative assessment and evaluation questions were added at the end of each scenario (fill-in-the-blank, puzzles, structured grids, concept cartoons, word association, identified trees, concept maps, etc). Afterwards, the scenarios were put in a specific order and an eight-week implementation plan covering the activities was prepared. The prepared scenarios, activity plans and alternative assessment and evaluation questions were presented to two faculty members working in the field of primary education and science education as expert opinions. These experts examined the forms in terms of suitability for purpose, suitability for student level, scenario content, clarity of expressions and scope validity and presented their evaluations. After these evaluations, the prepared activity forms were finalized. The parents of the students in the experimental group were informed about the implementation in a meeting. Subsequently, the necessary parental and school administrator permissions were obtained. Table 1 presents the scenarios prepared based on the socioscientific topic and the the life science outcomes they are related to.

Table 1.
Information on Prepared Scenarios

Week	Scenario	Learning Outcomes	Unit
1	Season Fall	L.S.2.2.5. participates in the decision-making process within the family.	Life at Home
2	We are at the market	L.S.2.3.6. recognizes the effects of consumption of vegetables and fruits based on the season on human health.	Healthy Living
3	Sweet Orange	L.S.2.3.1. recognizes the relationship between healthy development and growth and personal care, sports, sleep and nutrition.	Healthy Living
		L.S.2.6.1. compares the conditions required for the survival of plants and animals.	Life in Nature
4	Car Collection	L.S.2.4.1. classifies the means and types of transportation.	Safe Life
5	Secret Garden	L.S.2.5.8. observes the production activities in their immediate surroundings.	Life in Our Country
6	Turmoil in Our Neighborhood	L.S.2.4.5. Acts sensitively about the safe use of technological tools and equipment.	Safe Life
7	Beaver Fufu	L.S.2.6.3. provides some examples about the effect of natural elements in their immediate surroundings on human life.	Life in Nature
8	Recycling	L.S.2.6.4. contributes to the recycling of the consumed materials.	Life in Nature

The implementation process of the scenarios and activities was conducted during the life science course and was planned as two class hours per week on different days. The researcher divided the students in the study group into groups of three/four to enable them to discuss and decide on the scenarios created based on SSI. These groups were formed considering characteristics such as gender, performance, interest area, etc. and it was ensured that there were students at different levels within the group and that the groups had similar levels.

The researcher processed the subject based on SSI each week, supporting it with visual and auditory tools, and associated it with the determined outcomes. The teacher then distributed the scenario forms. In the first part of the form, students were asked to read the scenarios and reach a decision by identifying their solutions. Subsequently, group work was initiated, and the same scenario was discussed with the group members. Individual decisions were also examined. The purpose of conducting individual and group work simultaneously is to help students realize that there is no single aspect of a socioscientific issue and that there may be more than one solution. The researcher assumed the role of a mentor at this point. The researcher encouraged the students to relate the scenarios to real life and supported them in reaching a decision and generating solutions. Following the group work, all solutions were presented by each group and the solutions were discussed by the whole class.

The second part of the activity forms was followed in the continuation of the course. This section included multiple alternative measurement tools, which were prepared for the relevant scenarios and were used to measure the academic achievement of the students each week. Each student was expected to answer these forms and their answers were scored (10 points for each correct answer, maximum 50 points) based on their accuracy. Then, the questions on the form were re-solved under the guidance of the teacher and the students were allowed to check their mistakes. This implementation process continued for eight weeks and two lessons each within the life science course. Following the process, the lessons were continued based on the curriculum and to measure the persistence of the experimental process, the scales and achievement test were reapplied six weeks later as a retention test and the process was ended.

Data Collection Tools

In this study, the "Decision-Making Skills Scale for Primary School Students (DMS)," "The Life Science Course Attitude Scale (LSAS)," and "Academic Achievement Test (AAT)" were used as pre-post tests and retention tests as data collection tools, while activity forms were used to assess second-grade students during the process.

Decision-making skills scale (DMS) for primary school students

The scale was developed by Sever and Ersoy (2019) to assess the decision-making skills of primary school students. The scale is a four-point Likert-type scale, ranked as "Never (1)", "Occasionally (2)", "Usually (3)" and "Always (4)". The scale consists of 15 items and a single factor; the score range varies between 15 and 60, and no item is scored in reverse code. The scale's internal consistency coefficient (Cronbach's Alpha) is 0.89. In this study, the reliability coefficients of the DMS, administered as a pre- and post-test to second-grade primary school students, were calculated as 0.75 for the pre-test, 0.92 for the post-test, and 0.81 for the retention test. According to these calculations, the results of the scales applied as pre-post test and retention test were found to be reliable (Büyüköztürk et al., 2016).

The Life Science Course Attitude Scale (LSAS)

The scale was developed by Oker and Tay (2020) to assess the attitudes of primary school students towards the life science courses. The scale is a three-point Likert-type scale, ranked as "Disagree (1)", "Partially Agree (2)" and "Agree (3)". There are 16 items on the scale, and it consists of three sub-dimensions named negative attitudes towards the life science course (factor 1), positive attitudes towards the life science course content (factor 2), and positive attitudes towards the life science course (factor 3). The score ranges from 16 to 48 and six items in the scale are scored in reverse code. The scale's internal consistency coefficient (Cronbach's Alpha) is 0.88. The reliability coefficient calculations were performed for the LSAS, administered to second-grade primary school students as pre-test and post-test, and it was calculated as 0.82 for the pre-test, 0.78 for the post-test, and 0.60 for the retention test. According to these calculations, the results of the scales applied as pre-post test and retention test were found to be reliable (Büyüköztürk et al., 2016).

Academic Achievement Test (AAT)

The researcher developed the AAT based on the Second Grade The Life Science Textbook. For this achievement test, the unit evaluation questions in the course book distributed by MoNE free of charge were examined and an item pool was created. It was observed that the environment and environmental issues, the focal point of SSI within this pool, and the evaluation questions belonging to the "Life in Nature" unit, where students would directly observe concrete skills, reflected the purpose of the study more. In this context, six True-False, five fill-in-the-blank and seven multiple-choice questions were transformed into a written form using the question pool and presented to two faculty members working in the field of classroom education and science education for expert opinion. The experts examined the form in terms of student level, subject scope, scientific content and face validity and gave feedback. Corrections were made according to this feedback and the AAT was made ready for pilot implementation.

The Academic Achievement Test was administered to 202 second and third grade primary school students who were not included in the study group for pilot testing. After the pilot study, the top and bottom groups of 27% were determined and necessary item analyses (item difficulty index, item discrimination index) and Kuder-Richardson (KR-20) reliability coefficient calculations were made. The statistical results of the Academic Achievement Test after the pilot testing are presented in Table 2.

Table 2.
Results for AAT Item Statistics

Number of Questions	18
Sample Size	202
Kuder-Richardson (KR-20) Reliability Coefficient	0.52
Mean Item Difficulty (Pj)	0.67
Mean Item Discrimination (rjx)	0.31

No questions were omitted in the pilot study, and the average difficulty index of the AAT was calculated as 0.67, indicating moderate difficulty (0.20<Pj<0.80). The mean discrimination index of the test was calculated as 0.31 and revealed that the test was discriminative (0.30<rjx<0.39). After the item analysis, the Kuder-Richardson-20 (KR-20) reliability coefficient was calculated to determine the internal consistency of the scale and found to be 0.52. This value has low reliability (0.50<KR-20<0.60). It was predicted that the KR-20 coefficient might be low due to the fact that the students in the pilot study were not used to three question types at the same time. To eliminate this, this low reliability was mitigated since it was planned that the responses of primary school students to the alternative measurement tools in the activity form each week would also measure the change in their academic achievement. It is recommended that achievement tests to be used in research should be of medium difficulty and have high discrimination (Hasançebi et al., 2020). Since the item difficulty of the AAT was of medium difficulty (Pj=0.67) and the item discrimination was high (rjx=0.31), it was decided to use it in the experimental process. The reliability coefficient calculations (KR-20) for the AAT, administered to the second-grade primary school students as pre- and post-test in the experimental process, were calculated as 0.61 for the pre-test, 0.80 for the post-test, and 0.60 for the retention test. These calculations showed that the results of the achievement test administered as a pre-post test and retention test were reliable (Kalaycı, 2008). The range of points obtainable from the test varies between 0 and 18.

Activity forms

Two-part activity forms were prepared for scenario-based teaching based on SSI for use in the experimental process phase of the research. These forms were prepared both to present the SSI to students on a scenario-based, to enable them to enter into a decision-making process on these issues, and to monitor the development of primary school students' academic achievements during the research process. The first part consists of scenarios involving SSI, requiring binary decision-making, suitable for discussion through individual and group work, and daily life problems. The second part includes activities with alternative measurement tools suitable for the scenarios prepared based on the socioscientific topic. Different activities such as matching, fill-in-the-blank, puzzles, structured grids, concept cartoons, word association, identified trees, concept maps, etc., are included in this section, reinforcing what students learn, supporting retention in learning, and aimed at measuring academic achievement that week. A score range of 0 to 10 was assigned for each activity, with scoring based on the correctness of the students' answers. Students can receive a maximum of 50 points in total. Activity forms containing scenarios and alternative measurement tools were presented to two faculty members working in the field of classroom education and science education for expert opinion. These experts examined the forms for suitability for the purpose, clarity of the statements, and content validity. Following the required adjustments, the activity forms were finalized and administered to primary school students.

Data Analysis

The SPSS program was used to analyze the scales administered before and after the scenario-based teaching activities based on SSI. The normality of the data distribution was first examined in the analysis of the data. As the number of data in this study is less than 29, Shapiro-Wilk test results were analyzed. This value is greater than 0.05 for both pre-and post-test and the skewness and kurtosis coefficients being between +2 and -2 were taken as an indicator of normal distribution (Tabachnick & Fidell, 2001). The pre-post test normality test results of the data collection tools are presented in Table 3.

Table 3.
Normality Test Results

		Kolmogorov-Smirnov[a]			Shapiro-Wilk			Skewness	Kurtosis
		Statistic	df	Sig.	Statistic	df	Sig.		
DMS	Pre-Test	0.229	19	0.200	0.785	19	0.100*	-0.156	-1.439
	Post-Test	0.134	19	0.200	0.918	19	0.103*	-1.290	0.650
	Retention Test	0.157	19	0.200	0.893	19	0.086*	0.279	-1.535
LSAS	Pre-Test	0.107	19	0.200	0.956	19	0.493*	-0.022	-0.659
	Post-Test	0.224	19	0.083	0.872	19	0.055*	-0.823	0.032
	Retention Test	0.152	19	0.200	0.950	19	0.399*	0.164	-0.540
AAT	Pre-Test	0.106	19	0.200	0.972	19	0.812*	-0.060	0.804
	Post-Test	0.225	19	0.092	0.846	19	0.060*	-0.599	-0.998
	Retention Test	0.250	19	0.103	0.887	19	0.058*	0.562	-0.714

Table 3 shows that the distribution of the data was observed to be normal ($p>0.05$) and the skewness and kurtosis coefficients were in the range of +2 and -2, and therefore it has been decided to use parametric measurements. The mean scores of the primary school students from the pre-, post, and retention tests and the responses to the activity forms during the scenario-based activity process were analyzed using the Repeated Measure ANOVA (one-way repeated measures) test. This test is used to determine significant differences between measurements of members of the same group at different times. Each student's scores from the alternative measurement tools in the activity forms were calculated (0-50 score) and then the significant difference between their eight-week measurements was revealed. The assumptions of this test were verified before proceeding with the calculations, and the each results of the normality test and Mauchy's Test of Sphericity were calculated for the mean scores. Pairwise comparisons were performed with the Bonferroni test and Cohen's f formula was used to calculate the effect size according to variances. The results regarding the research sub-problems were presented and explained to the audience with the help of graphs and tables.

Validity and Reliability

The researcher has employed different measures to address issues that threaten the internal and external validity of the research. A single researcher collected all data (pre-post retention tests) in the classrooms where the students attended. Thus, there has been no change regarding the data collection tools, the place of collection, and the researcher collecting the data. Students may not be able to recall the post and retention tests after applying the pre-tests when measurement tools such as tests and questionnaires are used. Accordingly, the pre-test was administered before the fall semester MoNE mid-term break, and considering the eight-week implementation period, the interval between the administration of the pre-and post-test was prolonged to nine weeks, minimising the possibility of recalling the pre-test. The results were also reinforced by a retention test. In addition, the academic achievement of the students was evaluated not only with the pre-post test and retention test but also with their responses to the activity forms for eight weeks were scored. Thereby, the change in students' academic achievement during the process was also evaluated. The primary school students were not informed that a special experiment or research was being conducted during the course. Thus, the research was conducted within the natural course flow.

The researcher sought expert opinions on the aspects deemed necessary throughout the process to ensure the reliability of the study. In addition, the reliability of the measurement tools was analyzed, and the reliability coefficients of the pre-post test and retention tests of the two scales created for the sample group were calculated. The scales were considered to be reliable after these calculations. Likewise, the questions in the MoNE textbook, which were prepared by experts, were used to determine the AAT, and expert opinion was consulted again, and a pilot study was conducted. The achievement test was reviewed with statistical measurements made after the pilot application. The KR-20 of AAT was found to have low reliability. Alternatively, this low reliability was mitigated by planning that the responses of primary school students to alternative measurement tools included in the activity form each week would also measure the change in their academic achievement. Item difficulty index, item discrimination index, and

reliability coefficient calculations indicated that the achievement test is a reliable test that can be administered to second-grade primary school students. Moreover, values calculated for the pre-post and the retention tests in the actual implementation were interpreted as reliable.

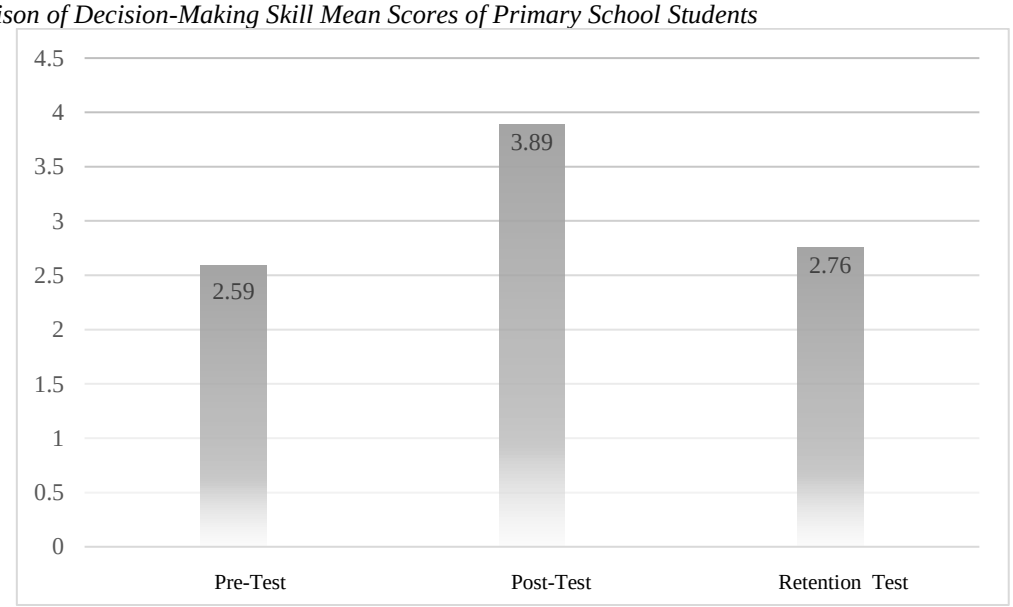
FINDINGS

This study investigates the effects of scenario-based teaching based on SSI on decision-making skills, attitudes toward the course, and academic achievement of primary school students. The results regarding the sub-problems of the study are listed below.

Impact of Scenario-Based Teaching on Primary School Students' Decision-Making Skills

Figure 2 presents the average decision-making skill scores of primary school students before and after the scenario-based teaching based on SSI and the retention test.

Figure 2.
Comparison of Decision-Making Skill Mean Scores of Primary School Students



According to Figure 2, the post- and retention test mean scores of the decision-making skills of primary school students were higher than the pre-test mean scores. The mean scores of the retention test were lower than the post-test mean scores, yet higher than the pre-test mean scores.

The variation of primary school students' mean scores on the DMS during the scenario-based teaching processes (pre-test, post-test, and retention test) about SSI was calculated with the Repeated Measure ANOVA test. The hypothesis of the repeated measures ANOVA test was analyzed before proceeding with the calculations. Once the required assumptions were satisfied, the differences between mean scores were compared pairwise with the Bonferroni test and the results are presented in Table 4.

Table 4.
Repeated Measure ANOVA Results Between DMS Mean Scores

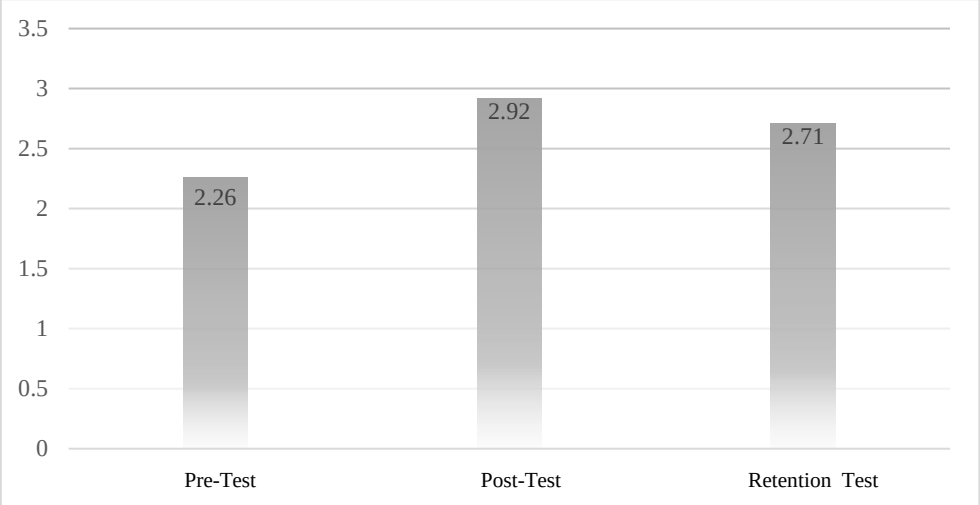
Test	$\bar{X}$	SD	Wilks' Lambda	F	p	Significant Difference
Pre-Test	2.59	0.76				Post-Test – Retention Test
Post-Test	3.89	0.12	0.162	44.026	0.000	Pre-test – Retention Test
Retention Test	2.76	0.57				Pre-Test – Post-Test

As shown in Table 4, the difference between the pre-test mean scores and the post-test and retention test mean scores of primary school students' decision-making skills was revealed to be statistically significant. The effect size ($\acute{\eta}^2$) was calculated as 0.76 and this value was interpreted as a wide effect (0.40<*Cohen's f*). This may be interpreted as the scenario-based teaching process performed based on SSI significantly increased the decision-making skills of primary school students.

Impact of Scenario-Based Teaching on Primary School Students' Attitudes Towards The Life Science Course

The mean the life science course attitude scores of primary school students before and after the scenario-based instruction based on SSI and the retention test were calculated and presented in Figure 3.

Figure 3.
Comparison of Mean the Life Science Course Attitude Scores of Primary School Students



When Figure 3 was examined, the primary school students' the life science course attitude post-test and permanence test mean scores were higher than their pre-test mean scores. Although the mean scores of the LSAS retention test were lower than the post-test mean scores, they were higher than the pre-test scores.

The variation of the mean scores of elementary school students on the LSAS during the scenario-based teaching period (pre-test, post-test, and retention test) based on SSI was calculated with the Repeated Measure ANOVA test. The mean scores were compared pairwise with the Bonferroni test and the results are presented in Table 5.

Table 5.
Repeated Measure ANOVA Results Between LSAS Mean Scores

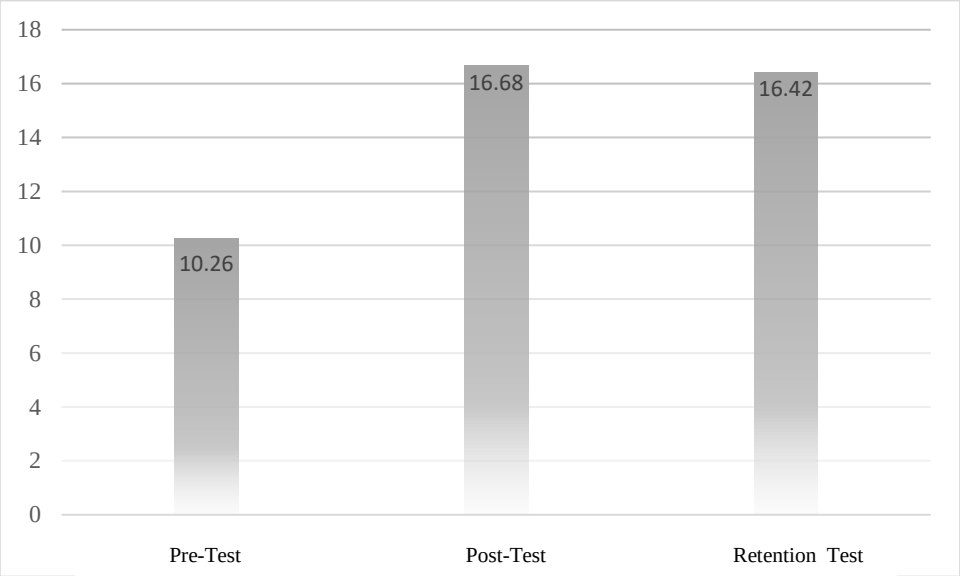
Test	$\bar{X}$	SD	Wilks' Lambda	F	p	Significant Difference
Pre-Test	2.26	0.40				Post-Test – Retention Test
Post-Test	2.92	0.07	0.209	32.153	0.000	Pre-test – Retention Test
Retention Test	2.71	0.15				Pre-Test – Post-Test

According to Table 5, the difference between the pre-and post-test and retention test mean scores of primary school students' attitudes towards the life science courses was statistically significant. The effect size ($\acute{\eta}^2$) was calculated as 0.79 and this value was interpreted as a wide effect (0.40<*Cohen's f*). This may be interpreted as the scenario-based teaching method based on SSI significantly increased primary school students' attitudes towards the life science course.

Impact of Scenario-Based Teaching on Primary School Students' Academic Achievement

The mean academic achievement scores of primary school students before and after the scenario-based instruction based on SSI and as a result of the retention test were calculated and presented in Figure 4.

Figure 4.
Comparison of Academic Achievement Mean Scores of Primary School Students



As shown in Figure 4, the mean scores of the post and retention tests of the academic achievement of the primary school students were higher than the mean scores of the pre-test. Although the mean scores of the LSAS retention test were a little lower than the post-test mean scores, they were higher than the pre-test scores.

The variation of the mean scores of elementary school students on the AATduring the scenario-based teaching period (pre-test, post-test, and retention test) based on SSI was calculated with the Repeated Measure ANOVA test. The mean scores were compared pairwise with the Bonferroni test and the results are presented in Table 6.

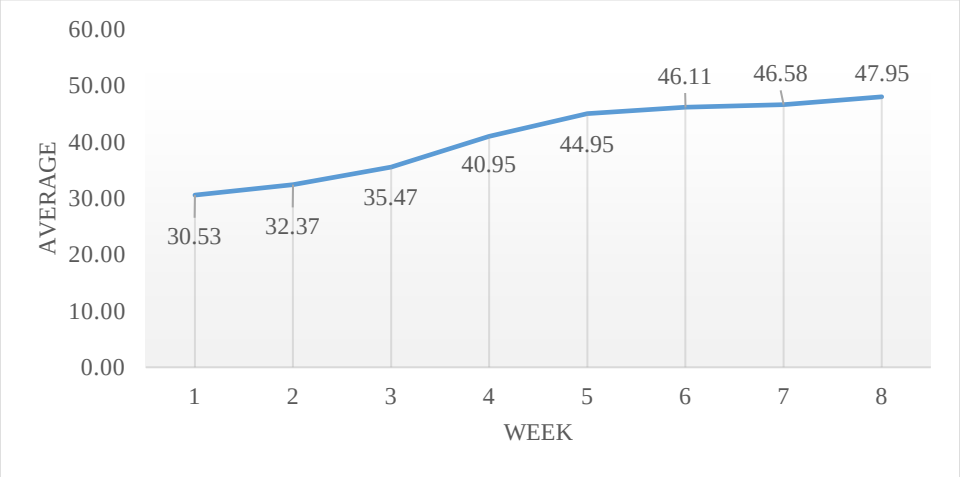
Table 6.
Repeated Measurements Between AAT Mean Scores ANOVA Results

Test	$\bar{X}$	SD	Wilks' Lambda	F	p	Significant Difference
Pre-Test	10.26	0.97				Post-Test – Retention Test
Post-Test	16.68	0.30	0.273	22.611	0.000	Pre-Test
Retention Test	16.42	0.29				Pre-Test

As shown in Table 6, the difference between the pre-test mean scores and the post-test and retention test mean scores of primary school students' academic achievement was revealed to be statistically significant. The effect size ($\acute{\eta}^2$) was calculated as 0.72 and this value was interpreted as a wide effect (0.40<*Cohen's f*).

The mean scores of primary school students from the alternative measurement tools included in the second part of activity forms were calculated during the scenario-based teaching process conducted based on SSI. These average scores were used to measure the change in primary school students' academic achievement over time. The weekly trend in the mean scores of primary school students is presented in Figure 5.

Figure 5.
Comparison of the Average Scores of Primary School Students from Alternative Measurement Tools



An analysis of Figure 5 reveals that elementary school students received an average score of 30.53 in the first week and 47.95 in the last week from the alternative measurement tools included in the activity forms during the scenario-based teaching process based on SSI. Figure 5 also demonstrates that there was an increase in their average scores throughout the process.

The change in the mean scores of primary school students on alternative measurement tools was calculated with the Repeated Measure ANOVA test. Repeated Measure ANOVA assumptions were tested and distribution normality and sphericity tests were performed. As a result of the normality test of the average scores formed throughout the process, $p>0.05$ was found, and the skewness-kurtosis coefficients were found to be between -2 and +2. As a result of the sphericity test, Mauchy's Test of Spericity value was found to be $p>0.05$, and repeated measures ANOVA assumptions were met. The results are presented in Table 7, which compares the differences between the average scores obtained throughout the process.

Table 7.
Repeated Measure ANOVA Results Between Activity Form Mean Scores

Week	$\bar{X}$	SD	Wilks' Lambda	F	p
1	30.53	2.18			
2	32.37	2.00			
3	35.47	1.82			
4	40.95	1.27	0.173	8.177	0.001
5	44.95	0.79			
6	46.11	0.96			
7	46.58	1.03			
8	47.95	0.60			

An analysis of Table 7 reveals that the difference between the mean scores of primary school students during the scenario-based teaching process in the context of SSI is statistically significant. The effect size ($\acute{\eta}^2$) was calculated as 0.82, and this value was interpreted as a wide effect (0.40<*Cohen's f*).

Evaluating these two findings together, the academic achievement of primary school students, both in the average scores they received from the academic achievement test and in the alternative measurement tools included in the activity forms presented throughout the process, increased significantly in the scenario-based teaching process carried out in the context of SSI. Therefore, the scenario-based teaching process implemented based on SSI can be interpreted as enhancing the in-class performance of primary school students weekly and increasing their academic achievement at the end of the process.

CONCLUSION AND DISCUSSION

This study investigates the effects of scenario-based teaching based on SSI on decision-making skills, attitudes toward the course, and academic achievement of primary school students. When the first result of the research was evaluated, it was concluded that the scenario-based teaching process based on SSI significantly increased the decision-making skills of primary school students with a significant effect. The need to use SSI for developing students' reasoning and decision-making skills is also emphasized in the science curriculum (MoNE, 2018a). It is emphasized that students who participate in activities focusing on SSI are better equipped for effective decision-making when they participate in consensus-building discussions in group activities (Sakamoto et al., 2021). Because scenario-based SSI activities enable students to use metacognitive strategies, group discussions enable them to recognize prejudices and can improve decision-making processes (Dauer et al., 2016). Karagöz et al., (2022) observed that socioscientific case scenarios improved students' ability to express their opinions and their interpretation, decision-making, sampling, and analogizing skills. According to Baysal (2021), activities with socioscientific subject content positively affected students' decision-making skills. Topaloğlu and Kıyıcı (2018) performed activities with SSI in out-of-school learning environments. They concluded that they had a positive effect on students' decision-making, raising their self-esteem level and being selective. These results are similar to the results of the present study. However, Acer (2022) concluded that the critical thinking skills of the students to whom SSI content was introduced showed moderate development but had no effect on their decision-making skills, while Özcan and Gücüm (2021) reached a different conclusion with the results of the present study by concluding that the scenario with SSI content (electronic waste) affected students' decision-making skills at a low level. The fact that there was more than one scenario based on the SSI in this study, that the process was designed as a group discussion, and that the younger age of the students may have contributed to the higher development of decision-making skills. According to a study by Dawson and Carson (2016), they used scenarios of climate change to assess students' argumentation skills and emphasised that the use of scenarios is significant in improving students' decision-making and that students should be in an interactive process with scenarios. However, involving students in SSI through peer interaction is considered valuable to support multi-perspective evaluation of different SSI (Leung, 2022), and this peer interaction can contribute significantly to the development of decision-making skills. Scenario-based instruction that includes SSI engages primary school students in real-world problems and encourages them to critically analyze, weigh options, and make informed choices.

When the second result of the research was evaluated, it was concluded that the scenario-based teaching process based on SSI significantly increased the attitudes of primary school students towards the life sciences course with a large effect. An individual's behaviour towards an event or phenomenon is related to the attitude formed in them. Cognitive, emotional and behavioral elements are effective in the formation of this attitude. However, the most important step to initiate this is to create awareness in the individual about that event or phenomenon (Ajzen & Fishbein, 1977). Thus, the awareness of the students encountering different SSI for the first time, and the scenario-based teaching and teaching the course in a way unlike the traditional approach may have contributed to the increase in this attitude. According to Bloom (1995), students' attitudes toward the course and subject affect their knowledge level in that subject, their desire to acquire knowledge, how they approach the course, their performance and interest. Demirci (2020) demonstrated that applications with socioscientific subject content had positive effects on students' reflective thinking, science orientation, attitudes towards these subjects, and motivation. According to Altay (2022), teaching with socioscientific topics had a positive effect on students' views and skills related to science and the nature of science and highlighted the mediating role of socioscientific topics in forming positive attitudes. Soydemir-Bor and Alkış-Küçükaydın (2021) concluded that the SSI instruction on artificial intelligence contributed to students' problem-solving and creative writing skills. However, they observed that students liked SSI courses. Eldowah and Alnajashi (2017) investigated a scientific topic with a socioscientific nature as an instructional tool and concluded that it positively affected students' attitudes. The results of existing research on socioscientific-based teaching enable teachers to adopt educational reforms, support teaching and shed light on student development (Chen & Xiao, 2021). Structuring the process based on SSI in this study contributed to the

development of students' attitudes toward the life science course.

Effective learning can be achieved when students are interested in a subject or course and develop positive attitudes toward it during learning and teaching processes. This effective learning enables students to be more successful in their studies (Erden & Akman, 1997). The negative attitude and perception are among the most significant factors behind every low-performing student (Chowdhury et al., 2020). Developing a positive attitude towards the lesson may enable the student in that period to actively participate in the course, to make various observations, to express their feelings and thoughts easily, and to be prepared for the lesson. Since students' positive attitudes towards the course lead them to love and be interested in learning and thus increase their success in the course, it is important to determine attitudes in the correct planning of the course. A positive attitude towards the course would increase the success of the students by providing the permanence of the information learned. Therefore, positive attitudes toward the course are considered to be an essential factor in increasing success. In the present study, implementing differentiation in the process of the life science course of primary school students, structuring the courses based on SSI, and applying them with scenarios were effective in increasing the attitude towards the course. This positive attitude may have had a significant effect on students' academic achievement and performance in the course. Yaman and Süğümlü (2009) have emphasized in their study that scenario-based teaching increases students' participation in the class and found that this method contributed positively to encouraging students to attend the class.

Considering other results of the study, during the scenario-based teaching process based on SSI, the difference between the academic achievement pre-and post-test and retention test mean scores of primary school students was found to be statistically significant. In addition, an increase was observed from the first activity to the last activity in the average scores of primary school students during the scenario-based teaching process performed based on SSI, and the difference between the average scores was statistically significant. When these two results are evaluated together, the scenario-based teaching process based on SSI significantly increased the academic achievement of primary school students with a large effect. Moreover, the high average scores in the retention test can be considered as evidence that the information learned was retained and that more effective learning was achieved. Activities based on SSI promote a more relevant and interesting learning environment for students. It has been emphasized that students show greater interest and motivation in discussions around SSI compared to traditional fact-based education, making these activities engaging for students, which in turn leads to improved academic outcomes for students (Nordqvist & Aronsson, 2019). Hofstein et al. (2011) emphasize that incorporating societal perspectives into science education through SSI topics is crucial for promoting scientific literacy, and argue that this supports academic achievement. Martini et al. (2021) stated that engaging students in discussions about various SSI topics significantly improves their academic achievement, which is crucial for students' argumentation skills. Özden (2020) revealed in his research that students who participated in SSI-based learning exhibited higher quality reasoning patterns, which is considered an indicator of academic achievement. Bakaç (2014) used scenario-based teaching in primary school-level courses and concluded that the process contributed positively to students' academic achievement. Temur and Turan (2018) integrated the scenario-based teaching approach into mathematics courses and found that elementary school student's ability to solve and construct problems requiring four operations and student achievement increased. Öztürk and Karakaş (2023) concluded that scenario-based teaching had a significant effect on primary school students' attitudes towards science and increased academic achievement. In this study, scenario-based teaching based on SSI within the life science course helped to increase the academic achievement of primary school students by increasing their in-class performance. The process of scenario-based teaching process based on SSI, makes the course more relevant and accessible to students by integrating real-world problems into the learning process, which leads to an increase in their academic achievement. In this context, it is expected that this process will be used at different education levels (secondary school and high school).

Limitations and Recommendations

There are some limitations of this study. The study was performed with a single group of primary school

students. The study could also be designed with a control group, and the results may be compared with the experimental group students. Adding a control group could make this research more generalizable. The life science courses are offered at different grade levels in primary schools. Activities integrated into the curriculum can be prepared with students at different grade levels, and this research can be repeated. This repeated study can be more extended in duration. Since socioscientific topics reflect real-life problems, the use of socioscientific topics from primary school onwards can be recommended to create a life-school context and provide real-life experiences. The scenario-based teaching method in socioscientific subjects may be recommended for teachers to use in classroom activities to engage students in the group discussion process, maximizing interaction and affecting their decision-making skills. The scenario-based teaching method in socioscientific subjects can help students develop positive attitudes towards the life science courses, and its applications by teachers at different grade levels and courses may help students develop positive attitudes towards the courses. The students developing positive attitudes toward coursework will be more active in the classes, and participate more in the activities, and their academic achievement will increase by improving their in-class performance. Therefore, this method may be recommended to be used by teachers to increase academic achievement and maintain the retention of the information learned.

Acknowledgement

This research is derived from the first author's master's thesis conducted under the supervision of the second author.

REFERENCES

Acer, B. (2022). *Covid-19 pandemisi bağlamına hazırlanan sosyobilimsel konu içeriklerinin ilkokul öğrencilerinin eleştirel düşünme ve karar verme becerilerine etkisi [The effect of socioscientific subject contents prepared in the context of Covid-19 pandemic on primary school students' critical thinking and decision-making skills]* (Unpublished master's thesis). Necmettin Erbakan University.

Açıkgöz, K. (2007). *Aktif öğrenme [Active learning].* Biliş Yayınları.

Agell, L., Soria, V. & Carrió, M. (2014). Using role play to debate animal testing. *Journal of Biological Education, 49*(3), 309-321. https://doi.org/10.1080/00219266.2014.943788

Ajzen, I. & Fishbein M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin, 84*(5), 888–918. https://doi.org/10.1037/0033-2909.84.5.888

Alptekin, S. (2012). Teaching the social skills to the mentally retarded students through direct instruction approach. *Ondokuz Mayis University Journal of Education Faculty, 31*(1), 1-19.

Altay, S. (2022). *Bilimin doğası ve sosyobilimsel konular etkinlikleriyle desteklenen araştırmaya dayalı öğretimin dördüncü sınıfların fen öğrenmelerine etkisi [The effect of inquiry-based instruction supported by NOS and socioscientific issues activities on fourth graders' science learning]* (Unpublished doctoral dissertion). Hacettepe University.

Arabacioglu, T. (2012). *Farklı iletişim ortamlarıyla yürütülen senaryo temelli öğretim programının temel bilgi teknolojileri dersi erişilerine etkisi [The effect of scenario-based curriculum with different communication media on basic information technology course achievement]* (Unpublished doctoral dissertion). Adnan Menderes University.

Ardwiyanti, D. & Prasetyo, Z. K. (2021, March). Exploring students' decision-making ability in the context of socio-scientific issues. In *6th International Seminar on Science Education (ISSE 2020)* (pp. 661-668). Atlantis Press. https://doi.org/10.2991/assehr.k.210326.096

Atabey, N., Topçu, M. S. & Çiftçi, A. (2018). The investigation of socioscientific issues scenarios: A content analysis research. *International Journal of Society Researches, 9*(16), 1968-1991. https://doi.org/10.26466/opus.474224

Avcı, D. & Bayrak, E. B. (2013). Investigating teacher candidates' opinions related to scenario based learning: an action research. *Elementary Education Online, 12*(2), 528-549.

Ayaz, E. & Bulut, İ. (2022). An investigation of primary education students', reasoning on socioscientific issues supported by online forums. *Cumhuriyet International Journal of Education*, *11*(3), 522-535. https://doi.org/10.30703/cije.1095121

Aydın, S. & Karışan, D. (2021). Science teachers ' opinions and attitudes towards socio scientific issues and their teaching orientations. *Trakya Journal of Education, 11*(3), 1251-1273. https://doi.org/10.24315/tred.797302

Bächtold, M., Pallarès, G., De Checchi, K. & Munier, V. (2023). Combining debates and reflective activities to develop students' argumentation on socioscientific issues. *Journal of Research in Science Teaching, 60*(4), 761-806. https://doi.org/10.1002/tea.21816

Bakaç, E. (2014). The effect of scenario-based learning method on student achievement in mathematics course. *Journal of Education and Humanities: Theory and Practice, 5*(9), 3-17.

Bayraktaroğlu, S. & Demir, K. (2011). *İşyerinde karar verme ve problem çözme yöntemleri [Decision making and problem solving methods in the workplace].* İş ve Meslek Danışmanlığı Derneği Yayınları.

Baysal, Z. N., Demirbaş, B., Özçelik, S. & Güneypınar Ş. (2021). An examination of the decision-making skill perceptions of third grade and fourth grade students in primary school. *Bartın University Journal of Faculty of Education, 10*(1), 85-96. https://doi.org/10.14686/buefad.590947

Betul-Cebesoy, U., & Chang Rundgren, S. N. (2021). Embracing socioscientific issues-based teaching and decision-making in teacher professional development. *Educational Review, 75*(3), 507–534. https://doi.org/10.1080/00131911.2021.1931037

Bloom, B. S. (1995). *İnsan nitelikleri ve okulda öğrenme [Human characteristics and school learning].* (Trans. Ed. D. A. Özçelik). MEB Basımevi.

Bögeholz, S. & Barkmann, J. (2005). Rational choice and beyond: Handlungsorientierende Kompetenzen für den Umgang mit faktischer und ethischer. *Komplexität.Lehr-und Lernforschung in der Biologiedidaktik, 2*, 211-224.

Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş. & Demirel, F. (2016). *Bilimsel araştırma yöntemleri [Scientific research methods]. (*21st Edition). Pegem Akademi. https://doi.org/10.14527/9789944919289

Carroll, J. M. (2000). Five reasons for scenario-based design. *Innteracting With Computers*, 13, 43-60. https://doi.org/10.1016/S0953-5438(00)00023-0

Chang-Rundgren, S. N., & Rundgren, C. J. (2010). From a separate to a holistic view of SSI. *Asia-Pacific Forum on Science Learning and Teaching, 11*(1), 1-24.

Chen, Y. (2022). The online teacher-student interaction level in the context of a scenario-based multi-dimensional interaction teaching environment. *International Journal of Emerging Technologies in Learning (Ijet), 17*(12), 135-149. https://doi.org/10.3991/ijet.v17i12.32083

Chen, L. & Xiao, S. (2021). Perceptions, challenges and coping strategies of science teachers in teaching socioscientific issues: A systematic review. *Educational Research Review*, 32, 100377. https://doi.org/10.1016/j.edurev.2020.100377

Chowdhury P., Rankhumise, MP., Simelane-Mnisi, S. & Mafa-Theledi, ON. (2020). Attitude and performance: A universal co-relation, example from a chemistry classroom. *Journal of Turkish Science Education, 17*(4), 603-616. https://doi.org/10.36681/tused.2020.48

Collins, F. & Tabak, L. (2014). Policy: Nih plans to enhance reproducibility. *Nature, 505*(7485), 612-613. https://doi.org/10.1038/505612a

Çakmakçı, E. (2009). *Karar verme becerilerinin kazandırılmasında drama dersinin ilköğretim 4. sınıf öğrencileri üzerindeki etkilerinin incelenmesi [Investigating the effects of drama course on 4th grade primary school students in gaining decision-making skills]* (Unpublished master's thesis). Eskişehir Osmangazi University.

Dauer, J., Lute, M., & Straka, O. (2016). Indicators of informal and formal decision-making about a socioscientific issue. *International Journal of Education in Mathematics Science and Technology, 5*(1), 124-138. https://doi.org/10.18404/ijemst.05787

Dawson, V. & Carson, K. (2016). Using climate change scenarios to assess high school students' argumentation skills. *Research in Science & Technological Education, 35*(1), 1-16. https://doi.org/10.1080/02635143.2016.1174932

Demirci, H. (2020). *Yansıtıcı düşünme etkinlikleri ile zenginleştirilmiş REACT stratejisinin öğrencilerin yansıtıcı düşünmelerine, fen öğrenimine yönelimlerine ve motivasyonlarına etkisi [The effect of REACT strategy enriched with reflective thinking activities on students' reflective thinking, science learning orientation and motivation]* (Unpublished master's thesis). İstanbul Cerrahpaşa University.

Eidin, E., & Shwartz, Y. (2023). From ideal to practical-A design of teacher professional development on socioscientific issues. *Sustainability, 15*(14), 11394. https://doi.org/10.3390/su151411394

Eldowah, A. & Alnajashi, S. (2017). The effectiveness of a multi-dimensional teaching strategy on students' attitudes and level of learned-helplessness. *International Journal of Psychological Studies, 9*(3), 1. https://doi.org/10.5539/ijps.v9n3p1

Ellis, A. K. (2007). *Teaching and learning elementary social studies*. Pearson Eduction Inc.

Erden, M. & Akman, Y. (1997). *Eğitim psikolojisi [Educational psychology]*. Arkadaş.

Ergin, Ö., Pekmez, E. Ş. & Öngel, E. S. (2005). *Kuramdan uygulamaya deney yoluyla fen öğretimi [Science teaching through experimentation from theory to practice].* Kanyılmaz Matbaası.

Evagorou, M., Jiménez-Aleixandre, M. & Osborne, J. (2012). 'Should we kill the grey squirrels?' a study exploring students' justifications and decision-making. *International Journal of Science Education, 34*(3), 401-428. https://doi.org/10.1080/09500693.2011.619211

Fadha, G. (2023). Use of e-modules based on socio-scientific issues in efforts to improve argumentation and decision-making skills of high school students. *Jurnal Penelitian Pendidikan Ipa, 9*(9), 7591-7598. https://doi.org/10.29303/jppipa.v9i9.3507

Farae, A. A. A. (2020). Acquiring critical* thinking skills and their relationship to decision-making skill among graduates of the American Institute (YALI) in Yemen: A case study. *Journal of Arts*, 17, 7-56. https://doi.org/10.35696/.v1i17.690

Filiz, A., Özsoy, N., & Koçak, Z. F. (2005). *Bilgisayar destekli trigonometri öğretimi [Computer assisted trigonometry teaching]*. 7. Akademik Bilişim Konferansı [7th Academic Informatics Conference], February 2-5, Gaziantep University.

Garrecht, C., Bruckermann, T. & Harms, U. (2018). Students' decision-making in education for sustainability-related extracurricular activities- A systematic review of empirical studies. *Sustainability, 10*(11), 3876. https://doi.org/10.3390/su10113876

Hasançebi, B., Terzi Y., & Küçük, Z. (2020). Distractor analysis based on item difficulty index and item discrimination index. *Gümüşhane University Science Institute Journal, 10*(1), 224-240. https://doi.org/10.17714/gumusfenbil.615465

Hofstein, A., Eilks, I., & Bybee, R. (2011). Societal issues and their importance for contemporary science education - A pedagogical justification and the state-of-the-art in İsrael, Germany, and the USA. *International Journal of Science and Mathematics Education, 9*(6), 1459-1483. https://doi.org/10.1007/s10763-010-9273-9

Johnson, P. & Besselsen, D. (2002). Practical aspects of experimental design in animal research. *Ilar Journal, 43*(4), 202-206. https://doi.org/10.1093/ilar.43.4.202

Jirout, J. & Zimmerman, C. (2015). *Development of science process skills in the early childhood years*. In: Cabe Trundle, K., Saçkes, M. (eds) Research in Early Childhood Science Education. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-9505-0_7

Kalaycı, Ş. (2008). *SPSS uygulamalı çok değişkenli istatistik teknikleri [Multivariate statistical techniques with SPSS]*. Asil.

Karagöz, F., Ecevit T. & Özdemir-Şimşek P. (2022). Environmental experience and views of eighth grade students via socio-scientific case scenarios. *Hacettepe University Journal of Education*, *37*(2), 541-559. https://doi.org/10.16986/HUJE.2020064746

Karahan, E., Bozan, M., Akçay, A. & Akçay, İ. (2023). An investigation of primary school students' critical thinking dispositions and decision-making skills. *International Journal of Educational Research Review, 8*(2), 137-150. https://doi.org/10.24331/ijere.1205285

Karim, F. & Cheng, T. (2018). Readiness in applying higher order thinking skills after attending courses. *Journal of Techno Social, 10*(2), 35-41. https://doi.org/10.30880/jts.2018.10.02.006

Kocadağ, Y. (2010). Senaryo *tabanlı öğrenme yönteminin genetik konusundaki kavram yanılgılarının giderilmesi üzerindeki etkisi [The effect of scenario-based learning method on the elimination of misconceptions about genetics]* (Unpublished master's thesis). Karadeniz Teknik University.

Kokolaki, A. & Stavrou, D. (2022). Pre-service primary teachers develop teaching artifacts on contemporary socioscientific issues. *Journal of Science Teacher Education, 34*(3), 287–306. https://doi.org/10.1080/1046560X.2022.2078546

Kumar, V., Choudhary, S. K. & Singh, R. (2024). Environmental socio-scientific issues as contexts in developing scientific literacy in science education: A systematic literature review. *Social Sciences & Humanities Open*, 9, 100765. https://doi.org/10.1016/j.ssaho.2023.100765

Ladachart, L. & Ladachart, L. (2021). Preservice biology teachers' decision-making and informal reasoning about culture-based SSI. *International Journal of Science Education, 43*(5), 641–671. https://doi.org/10.1080/09500693.2021.1876958

Laius, A., Post, A. & Rannikmäe, M. (2016). Assessment of scientific literacy of estonian gymnasium students during the operation of a competence-based science curriculum. *Universal Journal of Educational Research, 4*(5), 1142-1147. https://doi.org/10.13189/ujer.2016.040525

Lassoued, K., Awad, A. & Guirat, R. (2020). The impact of managerial empowerment on problem solving and decision making skills: The case of abu dhabi university. *Management Science Letters*, *10*(4), 769-780. https://doi.org/10.5267/j.msl.2019.10.020

Leung, J. S. C. (2022). A practice-based approach to learning nature of science through SSI. *Research in Science Education, 52*(1), 259-285. https://doi.org/10.1007/s11165-020-09942-w

Martini, M., Widodo, W., Qosyim, A., Mahdiannur, M., & Jatmiko, B. (2021). Improving undergraduate science education students' argumentation skills through debates on socioscientific issues. *Jurnal Pendidikan Ipa Indonesia, 10*(3), 428-438. https://doi.org/10.15294/jpii.v10i3.30050

MoNE [Ministry of National Education] (2018a). *Fen bilimleri dersi öğretim programı [Science curriculum]*. Milli Eğitim Bakanlığı, Talim ve Terbiye Kurulu Başkanlığı. Retrieved from https://mufredat.meb.gov.tr/Programlar.aspx

MoNE [Ministry of National Education] (2018b). *Sosyal bilgiler dersi öğretim programı [Social studies curriculum]*. Milli Eğitim Bakanlığı, Talim ve Terbiye Kurulu Başkanlığı. Retrieved from https://mufredat.meb.gov.tr/Programlar.aspx

MoNE [Ministry of National Education] (2018c). *Hayat bilgisi dersi öğretim programı [Life cience curriculum]*. Milli Eğitim Bakanlığı, Talim ve Terbiye Kurulu Başkanlığı. Retrieved from https://mufredat.meb.gov.tr/Programlar.aspx

MoNE [Ministry of National Education] (2024a). *Hayat bilgisi dersi öğretim programı, Türkiye yüzyılı maarif modeli [Life science curriculum]*. Milli Eğitim Bakanlığı, Talim ve Terbiye Kurulu Başkanlığı.

MoNE [Ministry of National Education] (2024b). *Türkiye yüzyılı maarif modeli, öğretim programları ortak metni [Education model for the Turkish century, common text of curriculum programs]*. Milli Eğitim Bakanlığı.

Nordqvist, O. & Aronsson, H. (2019). It is time for a new direction in biotechnology education research. *Biochemistry and Molecular Biology Education, 47*(2), 189-200. https://doi.org/10.1002/bmb.21214

Nuangchalerm, P., & Kwuanthong, B. (2010). Teaching "global warming" through socioscientific issues-based instruction. *Asian Social Science, 6*(8), 42-47. https://doi.org/10.5539/ass.v6n8p42

Oker, D. & Tay, B. (2020). Developing an attitude scale for the life science lesson and students' attitudes. *Kalem Eğitim ve İnsan Bilimleri Dergisi, 10*(2), 731-756. https://doi.org/10.23863/kalem.2020.173

Osman, K. (2012). Primary science: Knowing about the world through science process skills. *Asian Social Science*, *8*(16), 1-7. https://doi.org/10.5539/ass.v8n16p1

Ottander, K., & Simon, S. (2021). Learning democratic participation? Meaning-making in discussion of socioscientific issues in science education. *International Journal of Science Education*, *43*(12), 1895–1925. https://doi.org/10.1080/09500693.2021.1946200

Özcan, C. & Gücüm, B. (2021). Determination of the relationship between pedagogical field knowledge in teaching mathematics of classroom teacher candidates. *Mustafa Kemal University Journal of the Faculty of Education*, *5*(7) 224-239.

Özden, M. (2020). Elementary school students' informal reasoning and its' quality regarding socio-scientific issues. *Eurasian Journal of Educational Research, 20*(86), 1-24. https://doi.org/10.14689/ejer.2020.86.4

Öztürk, S. & Karakaş H. (2023). The effects of scenario-based instruction on scientific thinking habits, science lesson attitudes and academic achievement of primary school students. *Journal of Education for Life*, *37*(3), 764-779. https://doi.org/10.33308/26674874.2023373630

Rahayu, G. (2024). Socioscientific issue-based decision making at elementary school: Bibliometric analysis. *Indonesian Journal of Educational Research and Review, 7*(1), 36-48. https://doi.org/10.23887/ijerr.v7i1.68717

Pedretti, E. & Hodson, D. (1995). From rhetoric to action: Implementing STS education through action research. *Journal of Research in Science teaching*, *32*(5) 463–486. https://doi.org/10.1002/tea.3660320505

Sadler, T. D. (2004). Informal reasoning regarding socioscientific issues: A critical review of research. *Journal of Research in Science Teaching*, *41*(5), 513-536. https://doi.org/10.1002/tea.20009

Sadler, T. D., Barab, S. A. & Scott, B. (2007). What do students gain by engaging in socioscientific inquiry?. *Research in science education*, 37, 371-391. https://doi.org/10.1007/s11165-006-9030-9

Saka, M. (2023). Pre-service primary school teachers' application of the features of the nature of science to socioscientific. *Science Insights Education Frontiers, 14*(2), 2059-2075. https://doi.org/10.15354/sief.23.or092

Sakamoto, M., Yamaguchi, E., Yamamoto, T., & Wakabayashi, K. (2021). An intervention study on students' decision-making towards consensus building on socio-scientific issues. *International Journal of Science Education, 43*(12), 1965-1983. https://doi.org/10.1080/09500693.2021.1947541

Sever, İ. & Ersoy, A. (2019). Development of decision making skills scale for primary school students: validity and reliability study. *Cukurova University Faculty of Education Journal*, *48*(1), 662-692. https://doi.org/10.14812/cufej.533443

Siew, N. & Ahmad, J. (2023). The effects of SSI with thinking wheel map approach on curiosity towards stem of year five students. *Problems of Education in the 21st Century, 81*(1), 130-143. https://doi.org/10.33225/pec/23.81.130

Soydemir Bor, S. & Alkış-Küçükaydın, M. (2021). The effect of socioscientific issues teaching on primary school students on problem solving and creative writing skills in the theme of artificial intelligence. *Western Anatolia Journal of Educational Sciences, 12*(2), 432-446. https://doi.org/10.51460/baebd.904806

Sönmez, A. & Kılınç, A. (2012). Preservice science teachers' self-efficacy beliefs about teaching GM Foods: The potential effects of some psychometric factors. *Necatibey Journal of Science and Mathematics Education, 6*(2), 49-76.

Sönmez, V. (1998). *Hayat bilgisi öğretimi ve öğretmen kılavuzu [Life science teaching and teacher's guide]*. Anı.

Stefanova, Y., Minevska, M. & Evtimova, S. (2010). Scientific literacy: Problems of science education in Bulgarian school. *Problems of Education in the 21st Century*, 19, 113-118.

Tabachnick, B. G. & Fidell L.S. (2001). *Using multivariate statistics*. Needham Heights: Allyn & Bacon

Tang, K. Y., Lin, T. C. & Hsu, Y. S. (2023). Status and trends of socioscientific issues in educational literature: insights and extensions from a co-word analysis. *International Journal of Science Education*, *46*(11), 1073–1097. https://doi.org/10.1080/09500693.2023.2272603

Temur, D. & Turan, H. (2018). The effect of scenario based learning approach on solving problems of addition and subtraction of third grade students of primary school. *Kocaeli University Journal of Education, 1*(2), 72-84. https://doi.org/10.33400/kuje.451771

Tian, J. & He, G. (2020). The five-in-one teaching mode in the teaching of engineering courses. *Computer Applications in Engineering Education, 28*(6), 1683-1695. https://doi.org/10.1002/cae.22347

Tidemand, S. & Nielsen, J. (2016). The role of socioscientific issues in biology teaching: from the perspective of teachers. *International Journal of Science Education, 39*(1), 44-61. https://doi.org/10.1080/09500693.2016.1264644

Tomas, L., Ritchie, S. M. & Tones, M. (2011). Attitudinal impact of hybridized writing about a socioscientific issue. *Journal of Research in Science Teaching*, *48*(8), 878-900. https://doi.org/10.1002/tea.20431

Topaloğlu, M. Y. & Kıyıcı, F. B. (2018). The effect of activities conducted in out-of-school learning environments on students' opinions about socio-scientific issues: Organ donation and genetically modified organisms. *E-International Journal of Educational Research*, *9*(1), 36-50. https://doi.org/10.19160/ijer.350189

Topçu, M. S. (2015). *Sosyobilimsel konular ve öğretimi [Socioscientific issues and teaching]*. Pegem. https://doi.org/10.14527/9786053180203

Topçu, M. S. & Atabey, N. (2017). The effect of socioscientific issues based field trips on elementary school students' argumentation quality. *Bartin University Journal of Faculty of Education*, *6*(1), 68-84. https://doi.org/10.14686/buefad.263541

Ütkür, N., Kebapınar, Y. & Önder, A. (2016). An action research towards using case study method in life studies courses. *HAYEF Journal of Education, 13*(25), 41-58.

Wongsri, P. & Nuangchalerm, P. (2010). Learning outcomes between socioscientific issues-based learning and conventional learning activities. *Journal of Social Sciences, 6*(2), 240-243. https://doi.org/10.3844/jssp.2010.240.243

Villarín, L. & Fowler, S. (2019). Socioscientific issues to promote content knowledge & socioscientific reasoning in puerto rican high school students. *The American Biology Teacher*, *81*(5), 328-332. https://doi.org/10.1525/abt.2019.81.5.328

Viza, G. I., Martínez-Rincón, J., Alves, G. B., Jordan, A. N. & Howell, J. C. (2015). Experimentally quantifying the advantages of weak-value-based metrology. *Physical Review A, 92*(3), 032127. http://dx.doi.org/10.1103/PhysRevA.92.032127

Yacoubian, H. A. & Khishfe, R. (2018). Argumentation, critical thinking, nature of science and socioscientific issues: A dialogue between two researchers. *International Journal of Science Education*, *40*(7), 796-807. https://doi.org/10.1080/09500693.2018.1449986

Yaman, H. & Süğümlü, Ü. (2009). The effectiveness of scenario based-learning approaches on grammar instruction: "types of words" sample. *Dil Dergisi*, 144, 56-73. https://doi.org/10.1501/Dilder_0000000111

Zeidler, D. L., Herman, B. C. & Sadler, T. D. (2019). New directions in socioscientific issues research. *Disciplinary and Interdisciplinary Science Education Research*, *1*(1), 1-9. https://doi.org/10.1186/s43031-019-0008-7

Zeidler, D. L. & Nichols, B. H. (2009). Socioscientific issues: Theory and practice. *Journal of elementary science education, 21*(2), 49-58. https://doi.org/10.1007/BF03173684

Zeidler, D. L., Sadler, T.D., Simmons, M.L. & Howes, E.V. (2005). Beyond STS: A research- based framework for socioscientific issues education. *Science Education*, 89, 357–377. https://doi.org/10.1002/sce.20048

TÜRKÇE GENİŞLETİLMİŞ ÖZET

Sosyobilimsel konular, içerik olarak hem bilimsel konuları hem de sosyal konuları birlikte ele alan bunun yanı sıra bilime dayanan ikilemli konulardır (Yacoubian ve Khishfe, 2018). Bu konular, değişik görüşler ile değerlendirilebilen, bilimsel nitelik taşıyan, toplum için önemli, sosyal bakımdan önemli içeriklerdir (Atabey vd., 2018). Sosyobilimsel konular, toplumun değişen ve gelişen özelliğine ayak uydurabilen, düşüncelerini ifade edebilen, bilgiye ulaşabilen, bu konularda karar verebilen bireyler ortaya çıkarmakta birer araç rolü alabilmektedir. Sosyobilimsel konuların derslerde öğrencilere sunulması, irdelenmesi ve tartışılması, onların bilimsel bilgileri ışığında karar vermelerine, kıyaslama yapmalarına ve çevresindeki argümanları değerlendirmelerine imkân sağlar (Dawson ve Carson, 2016). Sosyobilimsel konular öğrencilerin belirgin olarak hayatında karşılaşabileceği yoruma açık ve iyi oluşturulmamış problemler olduğundan bu konuları tartışmak ve bu konularla ilgili karar vermek sorunların çözülmesinde önemli görülür. Sosyobilimsel konularla günlük yaşamla ilişkili olduğundan öğrenciler de ilgi alanlarına göre bu konulara dâhil olabilmektedirler (Stefanova vd., 2010).

Her ne kadar sosyobilimsel konuların öğretim programı alanında bir yöntem olarak kullanılması önerilse de çoğu zaman tercih edilen olayların öğrencilerin kendi günlük hayatlarından uzak olan ve ütopik senaryolar içeren etkinliklerin kullanıldığı görülmektedir (Pedretti ve Hodson, 1995). Dolayısıyla gerçek yaşamla ilişkilendirilmiş farklı sosyobilimsel konuları öğrenci seviyesinde senaryolaştırılarak sunulması erken yaşlardan itibaren öğrencilere kazandırılması istenen temel becerilerin oluşmasına zemin hazırlayabilecektir. Bu bağlamda araştırmacılar ilkokullarda Fen Bilimleri ve Sosyal Bilgiler derslerinin temelini oluşturan, yaşamla doğrudan ilişkili olan Hayat Bilgisi dersi önemli görmüşler ve bu derste sosyobilimsel konular bağlamında senaryo temelli öğretim etkinlikleri gerçekleştirmişlerdir. İlkokul öğrencileriyle sosyobilimsel konular bağlamında yapılan çalışmaların yetersiz olması (Acer, 2022; Altay, 2022; Soydemir-Bor ve Alkış-Küçükaydın, 2021) göz önüne alındığında, sosyobilimsel konuların hayat bilgisi dersi ile ilişkilendirilmesi bakımından önem teşkil edeceği düşünülmüştür. Bununla birlikte 2024 yılında yayımlanan Hayat Bilgisi Dersi Öğretim Programında öğrencilere günlük yaşamla ilgili, uzak ya da yakın çevrede karşılaşılabilecek problemlere dair görevler verilmesi uygulama esası olarak belirlenmiştir. Hazırlanan bu öğretim programında disiplinler arası bir anlayış ile "sosyal-duygusal öğrenme becerileri", "okuryazarlık becerileri", "değerler" bütünleşik ve etkin bir şekilde ortaya konulan öğretme-öğrenme uygulamaları yapılması önerilmiştir (MEB, 2024a). Buradan hareketle hayat bilgisi dersinde sosyobilimsel senaryoların kullanılmasının ilkokul öğrencilerine kazandırılması beklenen becerilerden olan karar verme becerisini etkileyeceği, bu derse yönelik tutumlarında değişim göstereceği ve bu tutumun akademik başarıya katkı sağlayacağı öngörülerek araştırma süreci yapılandırılmıştır.

Çalışmanın amacı hayat bilgisi dersinde sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretimin ilkokul öğrencilerinin karar verme becerilerine, derse yönelik tutumlarına ve akademik başarılarına etkisini belirlemektir. Bu bağlamda aşağıdaki sorulara yanıt aranacaktır:

1. Sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretimin ilkokul öğrencilerinin karar verme becerilerine etkisi ne düzeydedir?
2. Sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretimin ilkokul öğrencilerinin hayat bilgisi dersine yönelik tutumlarına etkisi ne düzeydedir?
3. Sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretimin ilkokul öğrencilerinin akademik başarılarına etkisi ne düzeydedir?

Araştırma nicel bir araştırma olarak tasarlanmış ve araştırmada deneysel desen kullanılmıştır. Hayat bilgisi dersinde düzenlenen etkinlikler öncesi ve sonrası ilkokul öğrencilerinin karar verme becerileri, hayat bilgisi dersine yönelik tutumları ve akademik başarılarındaki değişimi ölçmek amacıyla ön ve son testler uygulanmıştır. İşlem basamağında ders süreci yanında sosyobilimsel konular bağlamında senaryo temelli öğretim etkinlikleri 8 hafta boyunca uygulanmıştır. Bu süreçte senaryo formları kullanılırmıştır. Aynı zamanda sürecin kalıcılığını ölçmek adına aynı veri toplama araçları tekrar öğrencilere sunulmuş

ve kalıcılık testi şeklinde uygulanmıştır. İlkokul öğrencilerinden elde edilen bu veriler ile sekiz hafta boyunca etkinlik formlarından almış oldukları puanlar analiz edilip, veriler yorumlanmıştır. Araştırmacının sınıf öğretmeni olması ve hali hazırda kendi sınıfının bulunması deneysel süreçte kolay ulaşılabilir örnekleme seçme yoluna gitmesini sağlamıştır. Bu bağlamda İç Anadolu Bölgesinde yer alan bir ildeki ilkokulun ikinci sınıflarda öğrenim gören 19 ilkokul öğrencisi araştırmaya dâhil edilmiştir. İlkokul öğrencilerinin senaryo temelli etkinlik süreci boyunca öncesi, sonrası ve kalıcılık testlerinden almış oldukları ortalama puanları ve etkinlik formlarına vermiş oldukları yanıtlar Repeated Measure ANOVA (tek yönlü tekrarlı ölçümler) testi kullanılarak analiz edilmiştir. Hesaplamalara geçmeden önce bu testin varsayımları test edilmiş ve ortalama puanlar normallik testi sonuçları ile küresellik testi (Mauchy's Test of Spericity) değerleri hesaplanmıştır. Ortalama puanlar Bonferroni testi ile ikili karşılaştırmalar yapılmış ve varyanslara göre etki büyüklüğü hesaplanmasında *Cohen's f* formülü temel alınmıştır.

Araştırma sonucunda sosyobilimsel konular bağlamında gerçekleştirilen senaryo temelli öğretim süreci ilkokul öğrencilerinin karar verme becerilerini, hayat bilgisi dersine yönelik tutumlarını ve hem süreç boyunca hem de süreç sonunda akademik başarılarını geniş etki ile anlamlı bir şekilde arttırdığı ($p<.05$) sonucuna ulaşılmıştır. Ayrıca süreç boyunca etkinlik formlarında yer alan alternatif ölçme araçlarından ilk hafta 30,53 ortalama puan alırlarken, son hafta 47,95 ortalama puan aldıkları görülerek ortalama puanlar arası farkın da istatiksel olarak anlamlı olduğu ($p<.05$) tespit edilmiştir.

Sosyobilimsel konular gerçek yaşam problemlerini yansıttığında, yaşam-okul bağlamı oluşturma ve gerçek yaşam deneyimlerinin sağlanmasında sosyobilimsel konuların ilkokullardan itibaren kullanılması önerilebilir. Sosyobilimsel konularda senaryo temelli öğretim yöntemi öğrencileri grup tartışma sürecine sokması, etkileşimi üst düzeye çıkartması ve onların karar verme becerisini etkilemesi bağlamında sosyobilimsel konu içerikli senaryo temelli öğretimin öğretmenlerce sınıf içi etkinlerde kullanılması tavsiye edilebilir. Sosyobilimsel konularda senaryo temelli öğretim yöntemi öğrencilerin hayat bilgisi dersine karşı tutumlarını artırması dikkate alındığında, farklı sınıf kademelerinde ve farklı derslerde de öğretmenlerce uygulanması öğrencinin derslere yönelik olumlu tutum geliştirmelerine yardımcı olabilir. Derse yönelik olumlu tutum geliştiren öğrenciler, derslerde daha aktif olabilecekler, etkinliklere daha fazla katılım gösterecekler ve ders içi performansları daha da gelişerek akademik başarıları da artacaktır.