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The Effectiveness of Inquiry Based Activities Based on Authentic Learning Approach on 5th Grade Students' Academic Achievement and Creative Problem Solving Skills

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Abstract

Turkish Science Curriculum for secondary school students is based on an inquiry-based learning approach with an interdisciplinary perspective. Authentic learning; is an interdisciplinary, collaborative, learning method with authentic tasks, activities and assessments that requires high-level thinking skills, aiming to find solutions to real-world problems. The aim of this study was to investigate the effects of inquiry-based activities based on authentic learning approach on academic achievement and creative problem-solving skills of 5th grade students. The study group had 21 5th grade students in total, 7 of whom were girls and 14 were boys. The study group were students from a private school in Üsküdar, Istanbul Turkey in the 2018-2019 academic year. "The Propagation of Light" unit academic achievement test and the Creative Problem Solving Attribute Inventory were used as data collection tools. The data obtained in the study were analyzed using a statistical program. "Wilcoxon Signed Rank Test", which is one of the non-parametric tests, was used in the analysis of the academic achievement test. In the analysis of the Creative Problem Solving Attribute Inventory, "Dependent Groups t-test", which is one of the parametric tests, was used. In line with this analysis, it was concluded that the inquiry-based activities based on authentic learning approach affected students' academic achievement and creative problem-solving skills in a positive way. Suggestions were made based on the findings of the study.

Keywords: Authentic Learning, Creative Problem-Solving Skills, İnquiry-Based Learning, Science Teaching, Propagation of Light

Introduction

From the moment we were born, the first learning environment was our home with our family. Until attending to the kindergarten, the first education is given within family and the individual has the role of an observer. S/he tries to learn by imitating what s/he observes. S/he is passionate and curious to learn. As s/he is aging, s/he evaluates the options by using her/his pre-knowledge obtained through the first experiences. In other words, they benefit from their past experiences. In line with these experiences, new experiences are lived, and new learnings take place. The events s/he has experienced, her/his reactions to the events s/he has experienced, the results of these reactions and the individual's own reactions to these results are all in a process. This whole process is the real life itself. The more we use a piece of information or the more we know how to use it in our future, the more value we will place on that information. We try to keep them in our minds more, to learn better.

If we give students problems that they may encounter in daily life, students will want to find solutions to these problems. Because they will know the possibility that this problem or a similar one may come across them in their future or professional lives. This is one of the reasons why students

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are given real-life problems in authentic learning. Authentic learning is an interdisciplinary, collaborative learning method that aims to find solutions to real-world problems and has authentic tasks, activities and assessments that require high-level thinking skills.

While authentic learning provides learning, it prepares for the purposes and conditions that we will encounter in real life. It states that students should show complex abilities in the face of situations such as problem solving, collaboration, and research (Erten, 2020).

According to Herrington (2006), there are 9 components of an authentic learning environment. These; authentic contexts that communicate how knowledge will be used in real life, authentic activities, expert performances and modeling of the process, multiple perspectives and roles, collaborative accumulation of knowledge, reflection, articulation, coaching and structured support (educational scaffolding) and authentic evaluation. With all these components, we can state that the authentic learning environment has a design that reflects the complexity of real life, provides motivation for learning, and consists of real-world tasks. Thanks to the collaboration component, this learning environment, which allows many people with different views to work together while solving a common problem in the face of a problem, also allows students to talk about their work and provides support to other students and teachers in these environments.

Technology also has an important place in the selection and interaction of learning environment. The reason for this is that authentic learning enables technology to have an important place in our life outside the school life, in transferring the information we learn in the classroom environment within the school. Making a connection between these two environments allows teachers to create various opportunities while teaching with authentic learning (Erten, 2020). In authentic learning, the teacher should be in a supporting role towards the student and should improve and increase the student's performance (Renzulli, 1997).

According to Demirel (2019), Dewey also stated that education should be compatible with the realities of the world, enabling learning information that will be useful in daily life. Dewey, who advocated that the student should receive education actively, not passively, opposed the transfer of knowledge to the student with rote learning. Dewey's view of education is not independent of human nature. Human nature should be taken into consideration both during the teaching and learning of knowledge, and there should be an understanding of education that develops the innate characteristics of people and provides the appropriate skills. For this reason, it is thought that if students know that the information we learn in schools will guide us in the face of problems that may arise in daily life, their interest and relevance to the lessons will increase.

According to Lasry (2006), learning a concept or phenomenon is not an easy task, but a complex process that can last a lifetime. In science lessons, students encounter many concepts and phenomena and begin to know the world. Adapting the information given in science lessons to daily life is important for students to learn meaningfully. Developing students' scientific thinking, questioning, research and problem-solving skills is effective in enabling them to learn knowledge meaningfully (Varlı & Uluçınar Sağır, 2019). Inquiry based learning is an approach based on constructivist theory, focusing on the research process rather than product creation or problem solving, and developing high-level thinking and research skills (Lim, 2001; cited in Varlı & Uluçınar Sağır, 2019).

Shon (2001) states that teaching how to apply an authentic inquiry is one of the most permanent teaching methods. While this is being implemented, teachers want students to be included in their own inquiry, on one hand; and on the other hand, they consider the achievements of the course in the secondary details of the inquiry process (Shon, 2001). One of the important points in inquiry-based education is that student can comprehend why s/he learns the information while learning it. This situation can be better reinforced by an authentic problem that can be encountered by the student in daily life and concerns the subject to be learned. In order for the student to solve this problem, it is necessary to research, question and learn the subjects. In order not to receive the question of "Why do I need to know about this topic?", the teaching approach based on research and inquiry can be integrated with the daily life problems that form the basis of authentic learning. In this way, the student is provided to teach a subject like a scientist by researching, questioning, and experimenting, and how s/he should behave in the face of a problem, how s/he should develop solutions, and the importance of looking at real life problems from different perspectives are explained with authentic tasks and activities.

In this study, it was aimed to examine the effects of inquiry-based activities based on authentic learning approach on the academic achievement and creative problem-solving skills of 5th grade students. For this purpose, in the study "Is there any effect of inquiry-based activities based on authentic learning approach on the academic achievement and creative problem-solving skills of 5th grade students" question had been defined as problem statement.

In parallel to this problem statement the sub-problems of the study were defined as follow:

1. Do inquiry-based activities based on authentic learning approach have an effect on students' academic achievement?

2. Do inquiry-based activities based on authentic learning approach have an effect on students' creative problem-solving skills?

Method

Research Design

This research was based on the pre-experimental design in which one group pre-test/post-test design was used. In this design, the effect of the experimental procedure was tested with a study on a single group. Measurements of the dependent variable were obtained by using the same subjects and the same measurement tools as the pre-test before the application and the post-test after the application (Büyüköztürk et al., 2018).

Study Group

The study group of this research, selected through a convenience sampling method, consisted of 21 5th grade students in a private school in Üsküdar, Istanbul in the 2018-2019 academic year. The study group had 7 girls and 14 boys. The application of the activities conducted by one of the researcher in 22 lesson hours, which was the recommended lesson period for the "Propagation of Light Unit" in the science curriculum.

Data Collettion Tools

In this study; The "Propagation of Light" unit Academic Achievement Test and Creative Problem Solving Attribute

Inventory (Lin, 2010, as cited in Baran-Bulut et al., 2018) were used as data collection tools.

The Academic Achievement Test was developed by the researchers considering the achievements in the curriculum. The test consisted of 24 questions at first, 11 of them prepared by the researchers, and 13 of them were taken from the 5th grade textbooks, workbooks, and test books (Science 5th Grade "Başarı-Yorum 1, Başarı-Yorum 2 ve Soru Bankası, 2018") published by the private school, where the application was conducted. The pilot application of the academic achievement test was applied to 94 6th grade students who were studying at a public school in Istanbul, who had studied the content of this subject in the science course previous year. Students were given one lesson hour to complete the test. Item analysis of the data was made for each question, and statistical program was used to find the difficulty and discrimination levels. According to the item analysis, the average difficulty of this test was 0.59. A separate item discrimination index was calculated for each item. As a result of these analyzes, the item discrimination power of 14 questions with a total value of 0.40 and above was found to be high. Items 1 and 14 with a value below 0.20 were excluded from the test due to their low item discrimination. As a result, an academic achievement test consisting of 22 questions was created. The mean item difficulty of this test was calculated as 0.59. Accordingly, removing items 1 and 14 did not change the value of the mean item difficulty. After the item analysis of the pilot application applied to 94 students, the reliability analysis of the 22-question achievement test was conducted, and the KR-20 value was found to be 0.746. Since this value was above 0.70, the reliability of the test was acceptable.

The "Creative Problem Solving Attribute Inventory" developed by Lin (2010) and adapted into Turkish by Baran-Bulut et al. (2018) was used as the other data collection tool. The original inventory was a 5-point Likert-type scale consisting of 49 items and 5 factors. These factors are convergent thinking, divergent thinking, motivation, environment, general knowledge and skills. With the analyzes made by Lin (2010), the inventory was reduced from 49 items to 40 items (Lin, 2010, as cited in Baran-Bulut et al., 2018). The Cronbach Alpha coefficient of the 40-item model was calculated separately for each factor by Baran-Bulut et al. (2018). According to the analyzes of the researchers, the Cronbach Alpha internal consistency coefficient was respectively; 0.78 for convergent thinking, 0.79 for divergent thinking, 0.73 for motivation, 0.88 for environment, and 0.77 for general knowledge and skills. In this research the Cronbach Alpha coefficient of the creative problem-solving skills attribute inventory was calculated, and for the pre-test it was found as 0.933. The Cronbach Alpha coefficient of the post-test was found as 0.951. Because these values range between 0.80 and 1.00, it was determined that the pre- and post-test scores of this inventory were highly reliable.

Application Process

The application was made in the fall term of the 2018-2019 academic year and took 22 lesson hours in total. At the beginning of the study The Academic Achievement Test and The Creative Problem Solving Attribute Inventory were given to the students as pre-tests. After the pre-test processed, inquiry-based activities based on authentic learning approach were conducted with the students. After the end of the activities the Academic Achievement Test and the Creative Problem Solving Attribute Inventory were given to the students as post-tests.

The application was carried out for 5.5 weeks, 4 lesson hours per week. At the beginning of each activity, the questions had been asked to direct the interest and curiosity of the students to the lesson, or videos had been played, authentic problem scenarios presented. Additional research questions given to the students' to make them understand the scenarios. The power point presentations used to show the content. Authentic problems displayed on the smart board during the lessons. This provided convenience to the students in case they forgot the authentic problem or during their research in the lesson they could look back at the problem. The authentic problems and additional research questions were given in written to the students to keep in their portfolios. As a result of the authentic tasks given to them in these activities, the students designed four products in total. Some web 2 technologic tools were also used during the application. At each authentic product creation stage, the class was divided into four groups. The groups were called as the first, the second, the third and the fourth. The students were asked to do research while solving authentic problems. They did their researches as: the first group; from the information sources on the internet, the second group; from newspapers and scientific journals, the third group were asked to go to libraries and collect information from books and encyclopedias, and the fourth group from adults whom they thought might had information on the subject. In each activity, group members changed their groups, so that each student was given different tasks. At the end of the study, the students were included in different research groups as much as possible.

While the teacher was guiding the students as a guide throughout the study, the students made an effort to solve the given real-life problem. In the given problem scenario, hints are given in the scenario in order to reach the desired product. Thanks to these tips, the student determined which subjects s/he would do research on with the guidance of her/his teacher, reached a solution and designed this solution by making a prototype with a product s/he created herself/himself. Finally, the students communicated actively by sharing the information they learned and the design they created with their own solution with their friends. The students were given the opportunity to present their products in the last week's exhibition called "Authentic Festival".

Sample activity

Activity name: Amusement Park Problem The name of the first authentic activity implemented in the study was the "Amusement Park Problem". It took six lesson hours to implement this activity. The primary purpose of this activity was to enable students to learn that light follows a linear path in every direction, and to learn the subject by researching and questioning, along with the real life problem given to them. Since it was aimed to find the connection of authentic activities with the real world, the real life problem was presented to the students through a light maze that they will design in an empty space in an amusement park.

The real life problem: "While planning residential areas in a newly opened amusement park, after the vehicles such as bumper cars, carousels, gondolas, and ferris wheels were placed, it was noticed that there was an empty space in a small corner of the land. The builders of the amusement park stated that they wanted to design this area as a labyrinth. But in the labyrinth, little kids need a solution so they don't get lost. I wonder how the builders of the amusement park, who placed flat mirrors in certain corners of the maze, found a solution? If it were you, what solution would you think of? Design your own maze and indicate your solution."

Before presenting the authentic problem to the students, the amusement park photos were shown with the presentation prepared in advance in order to attract the attention of the students to the lesson, and they were asked whether they had been in the amusement park before. After attracting the attention of the students to the subject, the real life problem was presented to the students with a power point presentation. The students were asked about possible solutions for this problem. Before solving the real life problem, a second topic was mentioned so the students with they could better perceive the achievements and conduct research. Students were asked to do research on what the periscope is, where it is used and how it's working principles are.

Afterwards, the students designed a simple periscope with the materials they chose and understood the rules for the propagation of light. The reason why students are asked to do research and comprehend these rules themselves was to adopt this working style, which they would apply in future authentic activities, that was, to enable them to learn by researching and questioning at the stage of solving the real life problem given to them, and to get them accustomed to the necessity of putting what they have learned into practice using trial and error methods. The additional research question was "What is a periscope, what is it's mechanism of use?" given to the students. A solution was sought for the "Periscope Design" sub-problem in the first three lessons, and then the "Let's Paint" activity sheet was used. During the "Periscope Design", the students were divided into groups and did their research in teams and created their products. While learning the information, the students did researches from various sources and reached the results.

First, the students examined whether the information they had searched and gathered was true or not. In doing so, it was ensured that they criticize themselves and decide on the accuracy of the information impartially. In the learning process, students now understood how periscopes could be designed based on the laws of propagation of light, as they had knowledge about periscopes. Each working group made a periscope that they designed. After that, they were asked to draw a sun, mountains and forests on the activity sheet. They did the activity papers individually. While drawing the sun, it was examined whether they also drew light rays around it. The aim here was to make students think by questioning the word ray without telling them directly. In the remaining three lesson hours, the authentic problem was returned and solutions were sought and the main product was created. The real life problem that was given in the first lesson was shown to the class again with the power point presentation and the students were asked what could be done as a solution again.

The comparison made between the answers given by the students in the first lesson and the answers after gaining the information by their research and questioning. Students were divided into small study groups of different members and each group was asked to design their own maze. By dividing the students into small study groups, a collaborative environment was created in which they work as a team. After their research, the students had now mastered the achievements of the subject and designed their labyrinths as a group by finding their own solutions to the authentic task and using their creativity and imagination. Each group presented the labyrinths they designed as prototypes as a solution to the given real-life problem to their classmates. The research findings and products about periscopes were also shared with their classmates in the classroom environment, so that the groups who did researches in different ways transferred their knowledge to each other. In this way, peer education was also carried out and incomplete information between the groups was prevented.

Data Analysis

All of the data collected from the students with the Academic Achievement Test and the Creative Problem Solving Attribute Inventory before and after the implementation as pre-test and post-tests were analysed by SPSS 22.0 statistical software program. In order to select the appropriate analysis methods, it was examined whether the data were normally distributed or not with Shapiro-wilk test and skewness and kurtosis analyses. According to test results the appropriate analyses techniques were chosen.

While evaluating the "Propagation of Light" Unit Academic Achievement Test, 1 point was given for each correct answer and 0 for each incorrect or empty answer. With this scoring, pre-test and post-test scores were calculated for each student, and the data obtained was analyzed and evaluated with the SPSS 22.0 package program. For the analyses of the Creative Problem Solving Attribute Inventory, which is a 5-point Likert type scale; scoring was made as "Never=1, Rarely=2, Sometimes=3, Often=4, and Always=5". In order to determine whether the data showed a normal distribution, the Shapiro–Wilk test was applied, and the results of the skewness and kurtosis coefficients were also examined. The "Propagation of Light" Unit Academic Achievement Test was analyzed with the "Wilcoxon Signed Rank Test", one of the non-parametric tests. The Creative Problem Solving Attribute Inventory was analyzed with the "Dependent (Associated) Groups t-Test", one of the parametric tests.

Ethical Permission Information of the Study

In this study, all the rules stated in the Committee on Publication Ethics (COPE) were followed.

Results

The first sub-problem of the research was expressed as: "Do inquiry-based activities based on authentic learning approach have an effect on students' academic achievement?" Before making a choice about whether to use parametric or non-parametric analysis methods in the analysis of the data, it was examined whether the data showed a normal distribution.

According to the results of the Shapiro-Wilk test, the p value was found as 0.154 in the academic achievement pre-test, and this meaned that the data showed a normal distribution because the p value was statistically greater than 0.05 significance level. In the post-achievement test results, the p value was found as 0.034, and since this value was less than 0.05, it was seen that the data did not show a normal distribution.

According to table above while the lowest score calculated according to the percentile score obtained from the "Propagation of Light" Unit Academic Achievement pre-test was 37.5, the highest score was 79.1; the median of the test was 66.6 and the arithmetic mean was 62.8 (ss = 10.05). In the post-test analyses, the lowest score calculated according to the percentile score was 50, the highest score was 100 full points; the median of the test was 87.5 and the arithmetic mean was 85.6 (ss = 12.25). According to Kim (2013), when examining skewness and kurtosis values, the data obtained by dividing these values by their own standard deviations are between -1.96 and +1.96, and the data show a normal

Table 1. *The Shapiro-Wilk Test Results of the Academic Achievement Pre-Test – Post Test Scores*

Academic Achievement Test	Shapiro-Wilk	*N*	*p*
Pre-Test	0.932	21	0.154
Post Test	0.899	21	0.034

Table 2. *Normality Analysis of the Academic Achievement Pre-Test – Post Test Scores*

Academic Achievement Test	$\bar{x}$	ss	Median	Lowest Score	Highest Score	Skewness		Kurtosis	
						Statistics	Std. Deviation	Statistics	Std. Deviation
Pre-Test	62.8	10.05	66.6	37.5	79.1	-0.670	0.501	0.363	0.972
Post Test	85.6	12.25	87.5	50	100	-1.231	0.501	2.176	0.972

Table 3. *The Wilcoxon Signed-Rank Test Results for the Comparison of the Pre-Test - Post Test Scores of the Academic Achievement Test*

Academic Achievement Test Pre-Test – Post Test	N	Mean Ranking	Ranking Sum	Z	*p*
Negative Ranking[a]	0	0	0	-3.827	.00
Positive Ranking[b]	19	10	190		
Equal Ranking[c]	2				
Sum	21				

a. Post Test < Pre-Test b. Post Test > Pre-Test c. Post Test = Pre-Test

Table 4. *The Shapiro-Wilk Test Results of the Creative Problem Solving Attribute Inventory Pre-Test – Post Test Scores*

Creative Problem Solving Attribute Inventory	Shapiro-Wilk	*N*	*p*
Pre-Test	0.950	21	0.337
Post Test	0.918	21	0.080

Table 5. *Normality Analysis of the Creative Problem Solving Attribute Inventory Pre-Test – Post Test Scores*

Creative Problem Solving Attribute Inventory	$\bar{x}$	ss	Median	Skew-ness	Kurtosis	Skewness		Kurtosis	
						Statistics	Std. Deviation	Statistics	Std. Deviation
Pre-Test	4.02	0.55	4.10	-0.357	0.501	-0.877	0.972	0.363	0.972
Post Test	4.23	0.55	4.27	-0.642	0.501	-0.183	0.972	2.176	0.972

distribution. According to this information, for the result skewness value related to the achievement pre-test; -1.33, +0.37 for the kurtosis value, and the data presented a normal distribution. The result of the achievement post-test was for the skewness value; -2.45, 2.23 for the kurtosis value, and it was seen that the data did not show a normal distribution.

While the pre-test score showed a normal distribution, the post-test score did not show a normal distribution, so the evaluation was made with the Wilcoxon Signed-Rank Test, one of the non-parametric tests.

As a result of the analysis, since the *p* value (p = .00) was less than 0.05, it was seen that there was a statistically significant difference in favor of the post-test between the pre-test score and the post-test score (Z = -3.827; $p < 0.05$).

The second sub-problem of the research was expressed as: "Do inquiry-based activities based on authentic learning approach have an effect on students' creative problem-solving skills?" Before making a choice about whether to use parametric or non-parametric analysis techniques in the analysis of the data, it was examined whether the data showed a normal distribution.

According to the results of the Shapiro-Wilk test, the p value was found as 0.337 in the creative problem solving skills attribute inventory pre-test and 0.080 in the post-test, and it was found that the data showed a normal distribution in both tests, since the p value was statistically greater than 0.05 significance level.

The arithmetic mean of the creative problem solving skills attribute inventory pre-test was 4.02 (ss = 0.55) and the median value was 4.10; the post-test arithmetic mean was found as 4.23 (ss = 0.55) and the median value was 4.27. The results obtained by dividing the skewness and kurtosis values by their own standard deviations are; for the skewness value, this value was found to be -0.71 in the creative problem solving skills attribute inventory pre-test and -1.28 in the post-test. Kurtosis values for the pre-test; -0.90 and -0.18 for the final test. According to these results, since the values found must be between -1.96 and +1.96 in order for the data to present a normal distribution, it was determined that the data exhibited a normal distribution in both the pre-test and post-test.

Since the pre-test and post-test scores showed a normal distribution, the Dependent Groups t-Test, one of the parametric tests, was used.

Table 6. *The Dependent Groups t-Test Results for the Comparison of the Pre-Test Post-Test Scores of the Creative Problem Solving Attribute Inventory*

Creative Problem Solving Attribute Inventory	N	$\bar{x}$	ss	t	*p*
Pre-Test	21	4.02	0.55	-2.617	0.017
Post Test	21	4.23	0.55		

According to the table above, the p value (p = 0.017) was less than 0.05, it was seen that there was a statistically significant difference in favor of the post-test between the pre-test and the post-test scores of the Creative Problem Solving Attribute Inventory (t = - 2.617; p < 0.05).

Discussion, Conclusion and Suggestions

In order to find an answer to the question of whether there was a significant difference between the pre-test and post-test scores of the "Propagation of Light" unit academic achievement test, the statictical analyses were conducted. It was found that the arithmetic mean of the post-test was statistically meaningfully higher than the arithmetic mean of the pre-test. This was interpreted as the application implemented in this study affected the academic achievement of the students positively.

When the relevant studies in the literature, which are based on authentic learning and authentic assessment and combine them with different teaching methods and techniques, are examined, it has been concluded that it is effective in increasing the academic achievement of students. Aynas (2018) and Gençoğlan (2017) also integrated authentic learning with different teaching methods and techniques in their studies and mentioned that these studies had a positive effect on students' academic achievement. Karabulut (2018) conducted research on technology-assisted authentic learning activities with 7th grade students, 25 of whom were in the experimental group and 26 in the control group. reached to same conclusion. Dadlı (2017) carried out his work in the experimental group with authentic problem-based learning activities and in the control group with the traditional lecture method and applied the "Environmental Knowledge Test" to his students before and after the application in order to determine academic achievement level of the students. When the post-test scores of the groups were compared and analyzed, it was found that there was a statistically significant difference in favor of the experimental group. He explained that this situation increased the academic achievement of the experimental group students, who taught their lessons with authentic problem-based learning activities, in the "Human and Environmental Relationships" unit. As a result of Bruffy's (2012) doctoral dissertation to determine whether authentic tasks improve the academic performance and social interaction of special education students and other students, it has been found that social interaction increases with the use of authentic tasks. In this study, the academic achievement of the students was also examined, and the results of the authentic tasks related to academic performance were found acceptable.

In order to find an answer to the question of whether there was a significant difference between the pre-test and post-test scores of the Creative Problem Solving Attribute Inventory, the statictical analyses were conducted. It was found that the arithmetic mean of the post-test was statistically meaningfully higher than the arithmetic mean of the pre-test. This was interpreted as the application implemented in this study affected the creative problem solving skills of the students positively.

Studies in which authentic learning and problem-solving skills are examined in the related literature. Aynas (2018) concluded in his study that authentic learning had a positive effect on student's problem-solving skills. The students had positive emotions in the authentic learning process. He also stated that they developed positive behaviors towards the characteristics of authentic learning such as doing research, gathering information, looking from different perspectives, working in cooperation. In his study, Aydın-Aşk (2016) studied authentic task-oriented learning processes in the mathematics lesson and obtained the findings of students' problem-solving strategies from interviews with 6 students selected from the study group. From the opinions of the students, it was concluded that their motivation and self-confidence increased during the problem-solving stages. As a result of this situation, the researcher determined that he would help students in solving the problems they encounter in both daily life and school life. Dadlı (2017) conducted a study with 53 7th grade students, 26 of them in the experimental group and 27 of them in the control group; He taught the lesson with the traditional lecture method in the control group and with the authentic problem-based learning activities in the experimental group. The reflective thinking skills scale for problem solving was applied to determine the reflective thinking skills of the students, but no statistically significant difference was found between the reflective thinking skills scale pre-test and post-test scores. As this research and related studies support, it has been seen that inquiry-based activities based on authentic learning approach have a positive effect on increasing academic achievement and contribute positively to increasing students' problem-solving skills. Since authentic learning is a student-based approach, the teacher acts as a guide and the student needs information to solve the real-life problem given to him. Authentic learning, which enables the student to search the information herself/himself and thus learn by doing, plays a role in both increasing the academic achievement of the student and supporting the permanence of what s/he has learned. At the same time, there is an authentic problem taken from real life at the core of authentic learning. While students are learning, they also look for solutions to this authentic problem. For this reason, it is thought that authentic learning makes a positive contribution to the problem-solving process of students.

The biggest problem of today's people is that they cannot find a quick, sustainable and scientific solution to the problems they face. As the world becomes more global, individuals face more complex problems and their ability to find solutions to these problems has become much more important. Therefore, it is obvious that schools should be places that teach how to find solutions to real life problems, instead of being just places where information is transferred. While doing this, of course, curriculum goals should always be taken into consideration. Successful individuals of the future will only be individuals who can solve the problem they face in the shortest time possible by scientific methods. So, without wasting time, our children should experience scientific ways of solving real life problems in schools. It is recommended to conduct research on what can be done to adopt these methods and techniques in schools.

In this research, an approach that integrates the authentic learning approach covering the 5th Grade "Propagation of Light" and inquiry-based learning was used. Since authentic learning is a learning approach that requires a process, the number of authentic tasks and activities can be increased by extending the duration of the application. In the research, more activities can be done outside the classroom and web-based applications can be used in order to increase the interest and curiosity of the students in the activities. The usability of this application in different units of the Science course or in different courses and at different grade levels can be examined by other researchers.

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