

Effects of the project-based learning on academic achievement and attitude of students with mild intellectual disability in life science course

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Abstract

The aim of this study is to determine effects of the Project-Based Learning Approaches (PBLA) on academic achievement and attitude of students with Mild Intellectual Disability (MID) studying at 3th class of primary school in life science course. In the study, pre-test-post-test design, one group of pre-trial model, was used. The participants of the research consisted of 10 students MID. At the beginning of the study, "Life Science Achievement Test", "Life Science Attitude Scale" and "Concept Acquisition Interview" pre-test-post-test were applied to the students. It was found that at the end of the study, students with MID improved their academic achievement in life science education meaningfully and the attitude towards the course were developed in a positive direction with PBLA.

Keywords: Project-based learning, mild intellectual disability, academic achievement, attitude.

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1. Introduction

Developmental retardation, occurring early in life, is a condition that its effects will last in acquiring the skills needed for individual growth throughout the life. Mental disability, which is one of developmental retardation, is the situation where significant limitations and shortcomings in mental functions and conceptional, social and practical adaptive skills of individuals can be seen (Fidan Kurtdede & Akyol, 2011). Primary education is the most important step that effective ways of learning are taught in accordance with individuals' development characteristics, readiness and education level. One of the most appropriate courses that learning can be carried out effectively at this education level is Life Science course. This is because; life science course that involves the science and social science is a course where individuals acquire basic skills. Life Science course is one of the primary lessons that basically aims to equip children with skills and knowledge, tries to harmonize individuals with social life and other courses are also shaped with this course axis (Simsek, 2005). Life Science can be defined as the bonding process proved with the natural and social facts and the information obtained as a result of this process. As understood from this definition, natural and social phenomena and events are covered in this course (Sonmez, 1998). Students learn considering the events through life by taking experiences from these events, their duties as man and citizen and their responsibilities. In this way, knowledge and skills in accordance with the child's readiness level taught at an early age are expected to be transferred and used in later life (Akinoglu, 2004). In recent years, it is considered that science education, which is the foundation of life science courses, has an important place in the training of students with mild intellectual disability (MID) and intensive research is carried out in this context (Kocadag, 2009; Cawley, 1994; Mastropieri and Scruggs, 1994; Patton, 1993; 1995). Science education has many advantages in the development of skills such as thinking and problem solving skills of these students (Woodward, 1994). However, answering the question of which method, approach or education program is the most appropriate for students with MID is very important (Scruggs, Mastropieri, and Bonn, 2008). Emotional levels and personalities of these students should be taken into account and necessary targets should be established in order to achieve an active and meaningful participation if any work is going to be performed for these students (Bigge, Best, and Heller 2001). In this context, project-based learning approaches (PBLA) that involve practices and interrogative features and particular transaction processes and steps are most suitable for those students with recommended learning approaches in the literature. Project-based learning is a learning model that aims to take students from a passive receiver position in the learning and teaching process into investigating, examining, and using information to solve problems position (Ozdener and Ozcoban 2004). The project is an individual learning technique. Students do investigation homework in groups by this method. Each student examines the entire subject or a particular aspect of the subject through in-depth research. Roots of the PBLA are based on the idea of "progressivism" in the beginning of XX century. Constructivism by John Dewey, project method by Kilpatrick, learning through discovery approach by Bruner, group research models by Thelen can be seen as cornerstones in the formation of PBLA (Korkmaz and Kaptan, 2001). Kilpatrick is recognized with using and advocating the project technique. Erdem and Akkoyunlu (2002) state that the PBLA consists of carefully selected three concepts to indicate the form that today's educational systems need to be shaped into. One of these concepts is the "learning" concept drawing attention away from teacher to learner. Another is the "project" concept that points perception of designing or directing learning and highlights relational learning for a particular purpose rather than learning singular (Ayan, 2012). The project is doing depth research desired more information on a topic, thinking, imagining, constructing and ultimately putting forth a product. The reason why the approach bases the project is to emphasize the importance of the process aspect of the project instead of efforts to fulfill homework generating projects. Therefore, the expression of "project-based" is used.

Students make their own division of labor between them. They collect documents and resources relevant to their research. If necessary, experiments can be done to prove this information. In the life science course, subjects such as keeping the classroom and school clean, reforesting the school garden, making simple teaching tools, instruments and machines, making a simple light bulb,

preparing various circuits related to conductors and insulators to be tested in the electric circuit can be given as the project. A sweet competition can be generated among the students in the process of teaching the scientific method skills organizing project competitions at the end of the term (Kaptan 1999). Students should be given subjects of their interest in the projects. Projects should be planned by teachers carefully to be fun and exciting for students. Planned projects should not be too complex. Otherwise, students may not complete complex projects and this may cause reduction of students' interest in the subject. Teachers should guide in the choice of projects (Kaptan, 1999). The vision of life science curriculum is defined as educating individuals with basic life skills, self-aware, healthy and safe life, nature and environment-friendly, probing, high self-confidence, at peace with himself and round, internalized national and spiritual values (MEB, 2015). In this context, life science curriculum has a rich content to guide teachers and students in the preparation of projects.

A course planned on the basis of the PBLA is considered to develop creativity, learning skills and self-confidence of students. With this study, to what extent teaching process that is based on PBLA for third grade, life science course and the subject of " I love my country" is effective in the academic success of students with MID as well as their attitudes towards the course has been investigated. Research questions are:

What is the impact of PBLA in the subject of "I love my country" for life science on the academic success of students with MID?

What is the impact of PBLA in the subject of "I love my country" for life science on the attitudes of students with MID?

2. Methods

In this study, single group pretest-posttest design among the pre trial models was used. This model does not include random sampling and pairing. Symbolic appearance of the model is as follows (Buyukozturk et al., 2008):



G indicates the group; O1 indicates pre-test measurement from the experimental group; X indicates the experimental process; O2 indicates post-test measurement from the experimental group (Buyukozturk et al., 2008).

2.1. Study Group

The study was carried out by 10 students with MID in Pupa Student Integration Unit at Education Faculty of Karamanoglu Mehmetbey University.

2.2. Data Collection Instruments

"Life Science Course Achievement Test" developed by the researcher, " Life Science Course Attitude Scale" developed by Bektas (2008), and " Concept Acquisition Interview Form" developed by the researcher were used to gather data in the research.

2.2.3. Life Science Course Development an Achievement Test

Implemented experimentally. The achievement test was assessed by two academics who are experts in the measurement field and two classroom teachers. Initially the scale consisted of 20 items and the reliability and validity of item was tested with the pilot study. Internal consistency was calculated using SPSS 16 package program and 1 item whose item discrimination power was under .30 removed from the test and ultimately 19 questions were included. While Cronbach alpha reliability coefficient of the scale was found as .77, item difficulty index was calculated as .58 and item discrimination value was calculated as .48.

2.2.4. Life Science Course Attitude Scale

In the study, the scale, 3-point Likert-type and consisting of 10 items, developed by Bektas (2008) in the study of "Effect of Involvement of Students in Different Dominant Intelligent Group in Life Science Course on Project Achievement and Attitude" was administered in both experimental and control groups as pretest and posttest in order to measure students' attitudes towards life science course. Kaiser-Meyer-Olkin (KMO) value was found as .81 and the significance value of the Bartlett test was found as .000. Cranbach Alpha value of the scale was obtained as .83.

2.2.5. Conception Acquisition Interview Form

In the study, semi-structured interview form consisting of open-ended questions developed by the researcher was used to determine acquired conceptions after explaining the subject of "I love my country" with PBLA. Two measurement specialist academics and three teachers consulted while forming the interviews and structure and content validity of the interview form was provided. For reliability, the pilot study was conducted with two students and two faculty members coded their answers independently. The obtained data indicated the themes of "consensus" and "difference of opinion" and coding was performed accordingly. The reliability formula proposed by Miles and Huberman (1994) was used in the reliability calculation of 13 questions in the form. With the method of $\text{Reliability} = \frac{\text{Consensus}}{\text{Consensus} + \text{Dissidence}}$, coefficient of agreement between researchers has been found as .76 (10 / 10+3). This indicates the reliability of coding. It is considered that reliability value over .70 is accepted for research (Miles & Huberman, 1994).

2.3. Project Praxis

In the study, common outcomes of the subject of "I love my country" in life science courses for third grade in accordance with individualized education program designed for 10 students were determined and teachers and students decided to do the project of historical and cultural places in the city intended to acquire these outcomes.

1. They have received preliminary information on the subject and done brainstorming (Figure 1)

a.



Figure 1. (a) Preliminary practices for the project;

b.



(b) Brainstorming for the project

2. Students did research in the IT workshop for mosques, baths, museums and castle designs (Figure 2)



Figure 2. While doing research

3. Designs that would be used in the projects have been identified in the guidance of teachers (Figure3).



Figure 3. Choise of the project design

4. Materials were determined for the project and design process was expected to be completed in three weeks in a schedule

5. Some works started in had arts workshop for the project (Figure 4).

a.



Figure4. (a) Design development;

b.



(b) Design construction;

c.



(c) Design painting

6. Students were asked to present their projects by completing the design in three weeks

2.4. Analysis of The Data

SPSS 16.0 software package was used to analyse the data. To determine whether there is a significant difference on the academic achievement and attitudes with PLBA, non-parametric Wilcoxon Signed Rank test for repeated measures with the significance level, standard deviation and the mean have been looked. Furthermore, data obtained by interview forms were analysed and interpreted using content analysis, which is often preferred in qualitative analysis methods.

3. Results

3.1. Findings Regarding Life Science Course Achievement Test Score of Study Group

Table 1 indicates mean and standard deviation of the study group with PBLA regarding pre-test and post-test achievement scores.

Table 1. Pre-test, post-test, mean and standard deviation scores of the study group.

	N	Mean	Standard Deviation
Pre-test	10	33.5	12.03
Post-test	10	59	14.86

There has been an increase in achievement test mean scores of students with MID in the course with PBLA. It can be said that Life Science course with PBLA was effective in increasing success. Table 2 gives Wilcoxon signed rank test results regarding pre-test/post-test achievement scores of the study group with PBLA.

Table 2. Wilcoxon signed rank test results regarding pre-test and post-test achievement scores of the study group

Pre-test Post-test	N	Mean Rank	Rank Sum	z	p
Negative Ranks	0	.00	.00		
Positive Ranks	10	5.50	55.00	-2.81	.00
Equal	0				

Note: **Significant at the .05 level.

Difference between pre-test and post-test scores of students of the study group after the experimental procedure is in favour of post-test and significant [$z=2.81, p<.05$].

3.2. The results regarding life science course attitude scores of the study group

Table 3 gives Wilcoxon signed rank test results of the study group with PBLA regarding pretest and posttest attitude scores.

Table 3. Wilcoxon signed rank test results regarding attitude scores of the study group with/without PBLA

Pre-test Post-test	N	Mean Rank	Rank Sum	z	p
Negative Rank	3	5.5	16.50		
Positive Rank	6	4.75	28.50	-.71	.47
Equal	1				

Note: **Significant at the .05 level.

Table 3 indicates that there has not been statistical significant difference regarding attitude scores of students before and after PBLA [$z = .71, p > .05$]. However, considering mean rank and sum of rank, observed difference seems to be in favour of positive rank that is post-test scores.

3.3. Findings regarding Life Science Course Conception Acquisition Interview Form of the Study Group

To measure what extent students have received targeted acquisitions in the scope of the curriculum, content analysis was carried out in the context of themes and answers were coded. Emerging themes, codes, frequency of codes and percentage distributions were presented in Table 4.

Table 4. Theme and sub-themes of the Conception Acquisition Interview Form

Themes	Codes	Frequency	Percentage
1.The location and direction of Karaman in the map	South	9	90
	Counties	8	80
	Castle	9	90
2.Ancient places in Karaman	Aktekke	7	70
	Hatuniye	3	30
	Seki Bath Fountain	6	60
3. Natural Beauties in Karaman	Granary	8	80
	Cave	2	20
4. Culture of Karaman	Capital of Turkish Language	7	70
	Mehmet Bey	1	10
	City/County/Town	9	90
	Mayor/Road, bridge, pavement	7	70
5. Council			
6. Museum	Old things, works	9	90

Answers to the conception acquisition interview form revealed to what extent students gained information on the subject of “I love my country” with the achievement test. The interview form consists of six main themes. 9 participants (90%) stated “south” to the question of Karaman’s location in the map. 8 participants (80%) stated “Ayranci, Ermenek, Kazimkarabekir, Basyayla and Sariveliler” to the question of Karaman’s counties. 9 participants (90%) stated “castle” to the structure shown in the interview form. Furthermore, while 7 participants (70%) correctly indicated “Aktekke Mosque”, 6 participants (60%) known “Seki Bath Fountain” and 3 participants (30%) known “Hatuniye Madrasa” correctly. In third theme, 8 participants (80%) stated “granary” to the natural beauty shown in the photo and 2 participants (20%) known correctly the name of the caves in the province of Karaman. In the fourth theme, 7 participants (70%) stated “Karaman” to the question of the capital of the Turkish language and 1 participant (10%) stated “Mehmet Bey” to the question of who owns the statue shown in the photo. 9 participants (90%) ordered the villages of Ambar, Ayranci district, Karaman from the largest towards the small correctly. 7 participants (70%) stated “Mayor” to the question of who governs the council. 7 participants (70%) stated “making roads, bridges and pavements” as for the

question of responsibilities of the mayor. As the sixth theme, 9 participants (90%) stated “ old furnishings, artifacts” as for the question of what museums have.

According to data obtained through interviews, the majority of participants acquired gains in the subject of “I love my country” taught by PBLA.

4. Discussion and Conclusion

Many studies can be found in the literature reporting positive impact of applied science education on students with MID (Cevik and Oztas, 2015; Cevik and Duzgun, 2015; Bay, Staver, Bryan, & Hale, 1992; Dalton, Morocco, & Tivnan, 1997; McCarthy, 2005). Furthermore, leading scientific institutions in United States are being confirmed that applied science teaching leads to permanent learning and learning outcomes reach above their level (Rutherford & Ahlgren, 1990). In the study, PBLA in the course of life science conducted by students with MID had positive outcomes since it contains applications and practices in its centre. In the literature there are studies measuring academic achievements, attitudes or behavior changes of students MID using different teaching methods apart from PBLA.

Tezcan (2012) sought in his thesis to ensure the effective and permanent way of learning using information technologies in science and math that could facilitate their daily lives and help solve problems easier for students with MID. The study concluded that students’ academic success and persistency in their learning increased. Furthermore, Melber (2004) reported that it is necessary to incorporate the learning environment with events taking place students’ with special needs daily lives in order to increase their capacities in scientific literacy. Different teaching methods on the basis of practices that increase academic achievements of students with MID support the results of this study. Increases in both academic achievement and attitudes of students with special needs are consistent with studies in the literature.

In the literature, it is stated that releasing students in activities based on practices in science courses reduces students’ success and control. In this study, activities were restricted by expressing what they can or cannot do during the project. Scruggs & Mastropier (1995) and Patton (1995) state that it is necessary to be careful when choosing topics in practice-based studies for these students as the topic is linked with the success. This issue was considered in this study. Ilik (2009) used direct teaching methods in acquisition of conceptions in science courses for students with MID. In the study, the subject of solar system was preferred and direct teaching appeared to be effective for all informants. If it is considered that teaching of a specified and defined subject linked to daily life directly affects the success, this study proves that the subject of “I love my country” is an appropriate choice. Gurgur (2005) examined in his work the approach of cooperative teaching in the class with the mainstreaming and as a result of the study it is observed that the success of students with special needs has increased. Additionally, the study shows that these students demonstrated improvements in listening to lectures, participating in activities, communicating effectively with friends and teachers. This study indicated that PBLA that also includes cooperative learning could be used as a method in teaching and learning for these students. Academic achievement gained by PBLA and positive progress in attitudes suggests that the method used in this study is appropriate.

In this study, the subject of “I love my country” in life science course with PBLA was examined and different subjects in life science course can be studied. Likewise, PBLA can be tested areas such as math, science or language education. Yet, implementation of PBLA for students with MID can be measured to determine if their academic achievement and attitudes in the related course were affected in different disability groups.

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