



# Integrated Curriculum, Cooperative (Jigsaw II) and Project Based Learning Applications

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## Abstract

In this study, units in the curriculum of “Science and Technology”, “Maths”, “Social Studies” and “Turkish” at 4th graders of primary school were integrated under the topic of ‘ENERGY’. This integrated energy model done with Webbed model was applied by using conventional, cooperative and Project based teaching-learning activities. There are 15 students in experimental group 1 this teaching program was applied with conventional method, 21 students in experimental group 2 cooperative teaching technique jigsaw II was applied, 26 students in experimental group 3 project based learning approach was applied, and 21 students in control group integrated programs was used with conventional teaching methods. Research data was obtained with 4options multiple choice tests prepared in the courses of Science and Technology (25 items), Maths (27 items), Social studies (28) items and Turkish (31 items) and pretesting was done. The KR-20 reliability coefficients of these tests were determined respectively as 0.734; 0.872; 0.883 and 0.911. In comparison of difference between pre and post-test, Kruskal Wallis H test was used as non- parametric test. Intergroup pair comparison was done with Mann Whitney U test. At the end of comparison results, it was observed that integrated teaching program’s application with cooperative and Project-based learning and teaching increased the success of students significantly, but it was detected that even if teaching programs were integrated, conducting learning and teaching activities with conventional methods did not change students’ success significantly. In other words, it was appeared that teaching program alone was not enough for increasing the success of students, and it was necessary to integrate teaching and apply with student-centred activities.

**Keywords:** Integrated curriculum, Interdisciplinary curriculum, Thematic curriculum, Project based learning, Cooperative learning, Jigsaw II, Traditional instruction.

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## INTRODUCTION

Disciplined based learning in the midst of last era focused on the course term separated from each other. In last years, experts stated that disciplines have source of unique knowledge to be discovered but disadvantages of discipline based approach already exceeded the advantaged (Ark, 2017).

According to conventional paradigm, knowledge was a process determined by the sub-parts of classical disciplines and topics, well explained (universities and research institutes etc.), and occurred in open theoretical frames (Vasile & Lenuta, 2011). In this context, Ark (2017) stated that disciplines are monsters we created ourselves, Drake and Burns (2004) stated that innovative educators interested in increasing students' success were looking for ways to create meticulous and interesting programs.

It is essential that learning and teaching environment suitable for individual's nature and brain structure, rich in terms of stimulator, creating learning opportunity with doing and living should be created for their learning effectively and in an integrated way. According to the findings of Gestalt theory, a person perceives the whole as meaningfully and in an organized whole not separating the whole. Then, he discovers the relationship between whole and parts. That human brain perceives the whole more than parts and understands the whole better was discovered has led to the creation of human friendly environments as suitable for individual's nature in the studies of education.

The term of integration located in the natural working system of brain was seen suitable for human natural learning system and perceiving style of the World. Not only does its suitability for the brain function but the developing accumulation of knowledge's including many disciplines get together showed the importance of interdisciplinary teaching. The reflection of interdisciplinary teaching program and teaching to the education has gained importance thanks to the suitability of natural learning process of brain, reflection of the features of developing knowledge era, benefits to the indispensable factor of education such as student, teacher, program and parents. In the lights of truths appeared as human learning is integrative, Ahmadova (2002) stated that integrated teaching program was obvious with the German psychologist Johann Friedrich Herbart in 1800s and leader of progressivism John Dewey. Integrated program was used as same meaning with Project approach in 1920, core programs in 1930 and problem centred programs in 1950. After 1980s it was seen that integrated program had the meaning of multidisciplinary, interdisciplinary and transdisciplinary program design (Savaş, 2006, pp. 1-3; Drake & Burns, 2004).

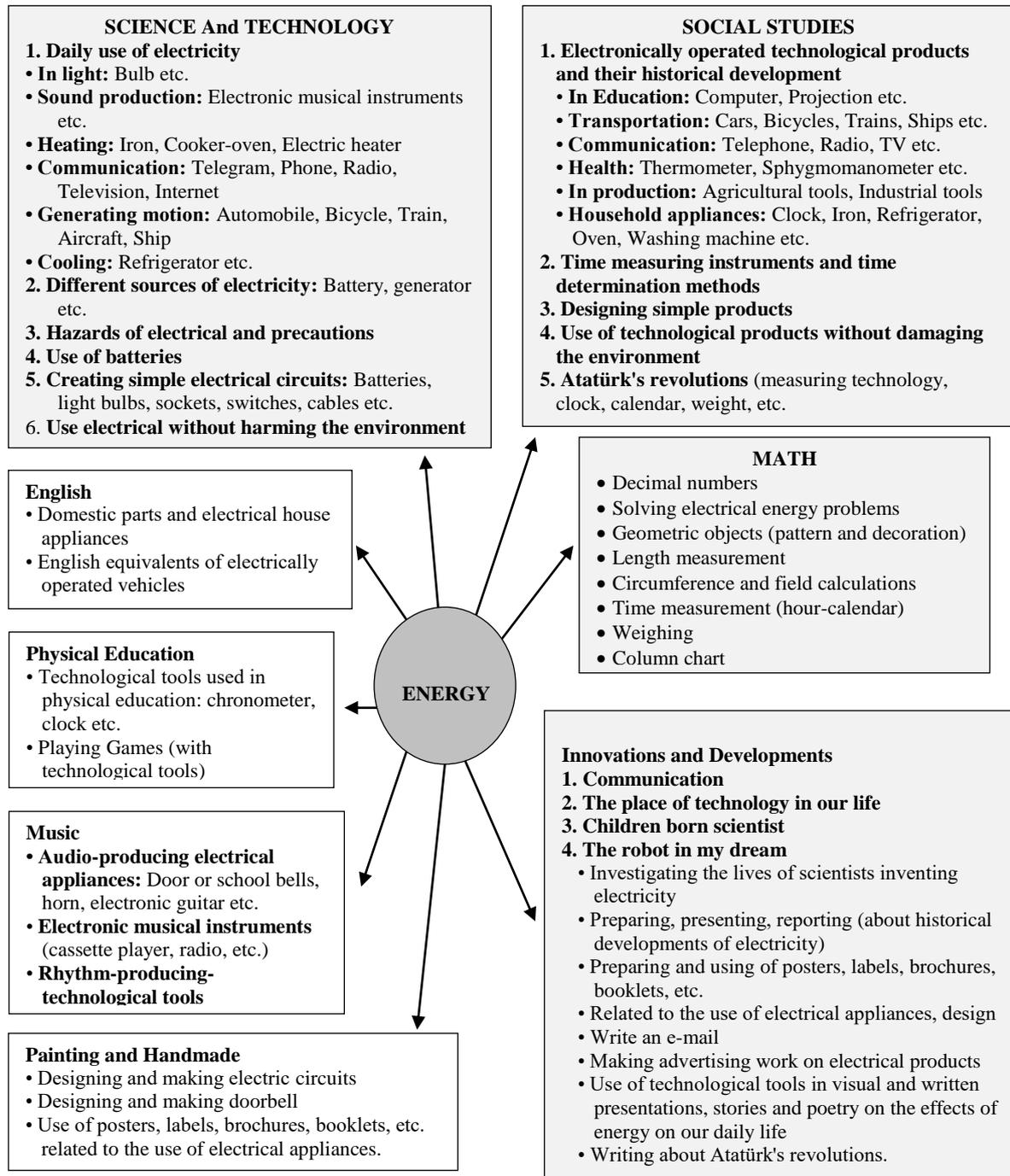
Integrated program setting connection between topics for students' participation to the meaningful activities related to the real life is today a focal point. Integrated curriculum and integrated teaching are described as a whole linking the topic fields, combining the different study fields organically by emphasising (Boyd, 2015). In this context, it was stressed that integrated program has benefits such as encouraging cooperation, experiencing the real world, linking the topics each other, getting the society into the process of education with project (Lake, 2014, pp. 189-197; Boyd, 2015, Roy, 1997, p. 209).

Disciplines are seen as important human successes giving the best answers to the main problems related to the World people created. On the contrary, supporters of integrating programs argue that information in real World is holistic and according to the teaching and learning topics, separating knowledge is an unnecessary tradition (Hatch, 1998).

In the studies related to the integrated teaching program Fogarty (1991), in the years after that Lake (2001, 2004) stated that teaching programs can be integrated in ten different ways. In this study Webbed model was used in terms of related units of all courses first of all Science and Technology, Maths, Social Studies and Turkish courses and in integrating goals. In this model a fruitful topic is taken to the centre, and related topics of other courses are

taught with it together. For example when machines are taught in Science and Technology, in literature the inventors' lives of these machines are taught. In the course of work and technic the function of these machines, in social studies historical events happened at the invention time of these machines, in art similar machines' pictures can be drawn (Senemoğlu, 2004; Lake, 2001-2004; Fogarty, 1991; Merickel, 1998; Gürkan ve Gökçe, 1999, pp. 29-39).

In this integration study, the topic of Energy gathering the all courses in the centre and a fruitful topic was used. Teaching program and teaching applications were done around the frames of this topic. Courses integration was done in this study and related units were given in figure1.



In this program integration as seen in figure 1, learning fields and aims such as in science and technology ‘Electricity in our life’ in social studies ‘so glad they exist’, in Turkish ‘innovations and developing’ and in maths ‘testing, input, numbers and geometry’ existed.

When learning fields of all courses, topics, sub learning fields and targets were investigated, expert ideas were taken in that units allowed natural integration, they can be taught together and in coordination, they are appropriate for integration. This integrated teaching program done under the Webbed model and the topic of Energy was applied in 3 different groups as conventional education, cooperation based learning ‘jigsaw’ and Project based learning approach.

As the data was collected from the for lessons integration was done, no comparison was done for the other courses.. Thus, in the study ‘*an answer was looked for the question is there a significant difference between the success of students in control group conventional methods was used for the teaching programs of ‘science and Technology’, ‘Maths’, ‘Social studies’, and ‘Turkish’ and the success of students in experimental group integrated teaching program was applied with conventional methods cooperative learning jigsaw II and Project based learning*

## METHODS

In this study with 3 experimental, one control group pre and post-test, experimental research design was used. In groups created randomly, data collection tools before and after application and experimental processes were given Table 1.

Table 1: Research Design

Groups		Pre-test (Data Collection Tools)	Experimental Operations	Post-test (Data Collection Tools)
Experimental Groups (n=3)	<b>Ex. Group I</b> (n=15)	<b>Success Tests</b> - Science & Technology (25 items)	Integrated curriculum and traditional teaching-learning activities	<b>Success Tests</b> - Science and technology
	<b>Ex. Group II</b> (n=21)	- Math (27 items) - Social Studies	Integrated curriculum and cooperative learning activities "Jigsaw II"	- Math - Social studies - Turkish
	<b>Ex. Group III</b> (n=26)	- Turkish (31 items)	Integrated curriculum and project based learning activities	
<b>Control Group</b> (n=21)			Normal curriculum and traditional teaching-learning activities	

As is seen in table 1, there are 1 randomly selected control group and three experimental groups. In control group topics in the teaching programs of the lessons were conducted with conventional education situations. In experimental group 1 integrated teaching program was conducted with conventional methods, in experimental group2 integrated teaching program was done with jigsaw II and, inn experimental group3 integrated teaching program was conducted with Project based learning approach. At same schools but in different classrooms in this study firstly the factors of volunteering and location were considered. 4<sup>th</sup> graders at this school were determined randomly whether they would be in control or experimental group. In studies conducted at a school located in a disadvantageous place of Ankara students created new products from wastes. These new products were exhibited at the end of studies with the participation of students, teachers, parents and peers in their classrooms.

## Data Collection Tools: Success tests

Research data was obtained with the pre and post test conducted as success test in the course of Science and technology, maths, social studies and Turkish. Analysis and table of specifications of the units selected for the integration were prepared. If the questions written by expert tested the target behaviour hence learning outcome, provided content validity, appropriate for the student level and written clearly were presented to the experts 'view. At the end of pre applications, KR-20 coefficient of reliability was found (37 items) 0,61 for science and technology, (36 items) 0,87 for social studies, (39 items) 0,85 for maths and (34 items) 0,92 for Turkish. At the end of item analysis and selection in post-tests the number of items were respectively 25, 27, 28 and 31. Reliability coefficient for post tests were observed respectively as 0,734; 0,872; 0,883 and 0,911.

## Analysis of Data

At the end of pre-tests score dispersion of control and experimental groups obtained from the Shapiro-Wilk Normallik Testi" it was determined that dispersion was not normal. It was detected that variances were not equal with the Test of Homogeneity of Variances. Due to these results nonparametric tests were used for comprising of students successes. Data obtained with the success tests conducted at the beginning and end of the experimental studies was analysed with "Kruskal-Wallis H Test" as the equivalent of intergroup one way analysis Anova from nonparametric tests (Büyüköztürk, 2017). At the end of this test in order to determine which groups had the significant difference, Mann –Whitney U test was used. In all comparisons significance level was found as 0.05.

## FINDINGS

Means and standard deviations obtained from the scores of pre and post-test developed for lessons and applied in a separated way were given in table 2.

Table 2: Descriptive Statistics of All Success Tests

Groups	n	Pre-Test		Post-Test		Access (Post – Pre)	
		Means	SD	Means	SD	Means	SD
Experimental Group 1	15	40.80	10.09	48.87	8.81	8.07	4.93
Experimental Group 2	21	48.57	8.36	67.00	10.59	18.43	4.79
Experimental Group 3	26	44.15	10.25	64.85	12.33	20.70	7.53
Control Group	21	45.38	8.29	52.62	9.34	7.24	2.39

As is seen in table 2 means of the differences of post-test and pre-test was found as in experimental group 1 8.07; experimental group 2 8.43; experimental group 3 20.70 and in control group 7.24. When learning outcomes were reviewed, the highest one was found in experimental group 3, and the lowest one was in control group.

Whether there was a difference between the learning outcome means of experimental groups and control group in all courses was tested with 'kruskal- Wallis H test 'and results were given in table 3.

Table 3: Testing the Difference between Access Averages (Kruskal-Wallis H Test)

Groups	n	Mean Rank	df	X <sup>2</sup>	p
Experimental Group 1	15	22.83	3	52.69	<.05
Experimental Group 2	21	56.98			
Experimental Group 3	26	60.10			
Control Group	21	18.31			

In table 3, it was seen that the difference obtained from the all courses between the learning outcomes by the students of control and experimental groups was significant statistically [ $\chi^2(3) = 52.69, p < .05$ ], which group this significant difference has was investigated with Mann-Whitney U test and findings were given in table 4.

Table 4: Comparing Groups with Mann Whitney U Test

Groups	n	Mean Rank	Sum of Ranks	U	Z	Sig.	P
Experimental Group 1	15	9.10	136.50	16.500	-4.536	.000	<.05
Experimental Group 2	21	25.21	529.50				
<b>Experimental Group 1</b>	<b>15</b>	<b>9.77</b>	<b>146.50</b>	<b>26.500</b>	<b>-4.566</b>	<b>.000</b>	<b>&lt;.05</b>
<b>Experimental Group 3</b>	<b>26</b>	<b>27.48</b>	<b>714.50</b>				
Experimental Group 1	15	19.97	299.50	135.500	-0.712	.476	>.05
Control Group	21	17.45	366.50				
<b>Experimental Group 2</b>	<b>21</b>	<b>21.81</b>	<b>458.00</b>	<b>227.000</b>	<b>-.987</b>	<b>.324</b>	<b>&gt;.05</b>
<b>Experimental Group 3</b>	<b>26</b>	<b>25.77</b>	<b>670.00</b>				
Experimental Group 2	21	31.95	671.00	1.000	-5.542	.000	<.05
Control Group	21	11.05	232.00				
<b>Experimental Group 3</b>	<b>26</b>	<b>33.85</b>	<b>880.00</b>	<b>17.000</b>	<b>-5.492</b>	<b>.000</b>	<b>&lt;.05</b>
<b>Control Group</b>	<b>21</b>	<b>11.81</b>	<b>248.00</b>				

The difference between experimental group 1 and experimental group 2 ( $Z = -4.536, P = 0.000 < 0.05$ ) was significant statistically in favour of group 2. In other words, the application of integrated teaching program with cooperation based learning activities increased the success of students more than conventional methods did.

It can be seen from table 4 that the difference between the mean of learning outcomes of experimental group 1 and experimental group 3 was significant statistically ( $Z = -4.566, P = 0.000 < 0.05$ ) in favour of experimental group 3.

When table 4 was reviewed, it was observed that the difference between the learning outcome means of experimental group 1 integrated teaching program conducted with conventional methods and the learning outcome means of control group Science and technology, maths, social studies and Turkish courses' teaching programs conducted with

conventional methods was not statistically significant ( $Z = -0.712$ ,  $P = 0.476 > 0.05$ ). In both groups that the teaching and learning process was formed with conventional methods such as discourse, one way question and answer, and course book, work book not making student activate could be one of the reasons of this result.

It was determined that the difference between the learning outcome means of the experimental group 2 integrated teaching program was conducted with jigsaw II and experimental group 3 this program conducted with project based learning approach was not significant ( $Z = -0.987$ ,  $P = 0.324 > 0.05$ ). According to the result given in table 4 it was observed that with 'integration II' project activities affected the success of students similarly.

It can be seen from table 4 that the mean difference of learning outcomes ( $Z = -5.542$ ,  $P = 0.000 < 0.05$ ) between the experimental group 2 integrated teaching program was conducted with jigsaw II and control group teaching program started to conduct in 2005 with conventional method was significant in favour of experimental group 2. According to these results, it is possible to say that integrated teaching program's conducting with cooperation based activities was more efficient than activities based on conventional methods.

It was found out that the difference ( $Z = -5.492$ ,  $P = 0.000 < 0.05$ ) between the learning outcome means of experimental group 3 integrated teaching program conducted with project based learning approach and control group teaching program started to conduct in 2005 with conventional method was significant statistically in favour of experimental group 3.

In comparisons done between control and experimental groups it was determined that the difference between the learning outcomes of experimental group 1 integrated teaching program conducted with conventional methods and control group teaching program started to conduct in 2005 with conventional methods was not significant. It was observed that the difference between the learning outcome means of the experimental group 2 integrated teaching program was conducted with cooperation based activities and experimental group 3 project based activities conducted was not significant statistically.

However, it was designated that cooperation activities conducted in experimental group 2 and project based activities done in experimental group 3 increased the success of students when compared with conventional methods conducted in experimental group 1 and control group.

## **DISCUSSION AND CONCLUSION**

At the end of this study, the application of teaching program by integrating with cooperation based learning method jigsaw II and project based learning activities created significant difference on the success of students. The teaching program conducted with conventional teaching and learning methods did not have significant difference even it was conducted by integrating or without integrating. In many studies of this field, it was determined that integrated teaching program increased the success of students significantly when conducted with various programs such as cooperation, project based, multiple intelligence and problem based learning when compared with the conventional education situations. (Kalyoncu & Tepecik, 2010; Demirel, Demir, Demirhan & Tuncel, 2008; Demir, 2007; Kaya, Akpınar & Gökkurt, 2006; Özkök, 2005; Tertemiz, 2004; Diker, 2004; Karakuş, 2004; Akins & Akerson, 2002).

As in this study in the process of teaching and learning, it was observed that cooperation based activities were more efficient in terms of increasing the success of students when compared with the conventional education situations in various studies cooperation based learning methods was used (Yılar & Şimşek, 2017; Alabekee, Samuel & Osaat, 2015; Yıldız & Bümen, 2013; Demir, 2012; Demir, Savaş, Kayapınar & Çankaya, 2012; Savaş,

Senemoğlu & Kocabaş, 2012; Güvenç & Açıkgöz, 2007; Bozdoğan, Taşdemir & Demirbaş, 2006; Sönmez, 2005, Chan, 2005).

In the studies of interdisciplinary teaching program conducted with project based learning approaches, project activities were more efficient in terms of increasing the success of students when compared with conventional teaching activities (Ergül & Kargın, 2014; Yolcu, 2013; Demirel & Coşkun, 2010; Özer, 2010; Choi & Pak, 2007; Cengizhan, 2007; Çıbık, 2006; Diker, 2004; Özdener & Özçoban, 2004; Yurtluk, 2003; Demirhan, 2002; Korkmaz, 2002; Kurt, 2001; Demirel, Başbay, Uyangör & Bıyıklı, 2000; Thomas, 2000; Krajcik, Blumenfeld, Marx & Soloway, 1994).

Demir (2012), Demir, Savaş, Kayapınar ve Çankaya (2012), Cengizhan (2007), Kılıç (2006), Gömleksiz ve İflazoğlu (2001) by reaching the similar results in their studies determined that teaching methods in the methods of cooperation based were more efficient in terms of increasing the success of students than conventional education situations did.

In many studies project based learning approach conducted in the process of teaching and learning these approaches affected the success of students, social and emotional features of students positively when compared with conventional education situations (Gültekin, 2007; Yıldızbaş & Canoğlu, 2007; Özdener & Özçoban, 2004).

In this study, integrated teaching program jigsaw II in experimental group 2, project based learning approach activities conducted in experimental group 3. In the core of project based learning approach depending on its structures to Kilpatrick and Dewey there is 'Group research' one of project based methods supported by Dewey. According to this situation, it can be said that the most important and single part of project based and cooperation approaches is 'cooperation'. Therefore, it was observed in various studies that these two approaches having cooperation in their core affected the academic, social and emotional features of students similarly (Tuncel-Ayvaz, 2008; Gültekin, 2007; Özkal, 2000; Demirhan, 2002; Açıkgöz, 1993).

In conclusion, as in the whole results of researches exemplified above in this study the application of integrated teaching program with student centred teaching and learning activities such as cooperation and project based affected the success of students positively.

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