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DESCRIPTIVE CONTENT ANALYSIS OF PROBLEM-BASED LEARNING RESEARCHES IN SCIENCE EDUCATION IN TURKEY

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Abstract

In this study, descriptive content analysis was performed on the theses that are particularly done on application of Problem-Based Learning (PBL) in science education research in Turkey in terms of the subjects matters studied, the methods employed, sample that subject to investigation, data collection tools and the data analysis methods used. To this end, descriptive analysis of a total number of 40 theses, including 28 master's and 12 PhD theses, on PBL in science education made between the years 2001-2012 and obtained from the Higher Education Council's Thesis Database in full text with permission, was made. It was found that 97.5% of the theses, whose descriptive analysis was made, focused on the effect of PBL on learning. And quantitative research design was used 95%, and among this design, mostly quasi-experimental research design with a rate of 85% was used. It was seen that the commonly used data collection tools were achievement test and interest-attitude-aptitude tests. In terms of sample group of the studies, it was seen that there were more studies carried out with undergraduate and primary school (6^{th}-8^{th} graders) students. Findings of this study show that studies on PBL were not widespread in our country until 2006 and that the increase between the years 2006-2010 started to decrease as of 2011. In addition, it was found that most of these studies made were in science and technology education at primary level. It is believed that this study is important in terms of giving an idea to science educators working on PBL and young science educators who are planning to particularly work on application PBL in science eduation.

Key Words: *Descriptive content analysis, Masters and PhD theses, Problem-Based Learning, PBL,*

TÜRKİYE'DE FEN EĞİTİMİNDE PROBLEME DAYALI ÖĞRENME ARAŞTIRMALARININ BETİMSEL İÇERİK ANALİZİ

Özet

Probleme Dayalı Öğrenme (PDÖ) öğrencilerin günlük yaşamlarında karşılaştıkları veya karşılaşabilecekleri problem durumlarına alternatif çözüm önerileri üretebilmelerini sağlayan aktif öğrenme yöntemlerinden biridir. Bu çalışmada ülkemizde fen eğitimi alanında PDÖ'yle ilgili yapılan yüksek lisans ve doktora tez çalışmalarının araştırma konusu, yöntem, örneklem, veri toplama araçlarının çeşitliliği ve verilerin analiz yöntemleri gibi değişkenler dikkate alınarak bir betimsel analizi yapılmıştır. Bu amaçla fen eğitimi alanında PDÖ'yle ilgili 2001-2012 yılları arasında yapılmış ve YÖK tez merkezinden tam metin ve izinli olarak ulaşılan 28'i yüksek lisans 12'si doktora olmak üzere toplam 40 tezin betimsel içerik analizi yapılmıştır. Tezlerin %97.5'inde PDÖ'nün öğrenmeye olan etkisi üzerine yoğunlaşıldığı tespit edilmiştir. Kullanılan araştırma yöntemi bakımından ise %95'lik bir oranla nicel araştırma deseni ve bu desenden %85'lik bir oranla da yarı deneysel araştırma deseninin çoğunlukla kullanıldığı görülmüştür. Yaygın kullanılan veri toplama araçlarının başarı ve ilgi-tutum-yetenek testleri olduğu belirlenmiştir. Örneklem seçimi bakımından lisans ve ilköğretim (6-8) öğrencileriyle yürütülen çalışmaların daha fazla olduğu görülmektedir. Araştırmadan elde edilen bulgular, PDÖ'yle ilgili çalışmaların ülkemizde 2006 yılına kadar pek yaygın olmadığını, 2006-2010 yılları arasında var olan artışın 2011 yılından itibaren yeniden azalmaya dönüştüğünü göstermektedir. Ayrıca bu çalışmaların büyük bir çoğunluğunun fen ve teknoloji alanlarında yapılmış olduğu tespit edilmiştir. Bu çalışmanın PDÖ'yle ilgili çalışan ve yeni çalışmayı düşünen genç araştırmacılara bir fikir vermesi açısından önemli olduğu düşünülmektedir.

Anahtar Kelimeler: *Betimsel içerik analiz, Yüksek lisans ve Doktora Tezleri, Probleme Dayalı Öğrenme, PDÖ*

1. Introduction

For Keeves (1998), the history of science education cannot go past 1850s. The first studies on science education started at the end of 19th century and beginning of 20th century; its development gained significant impetus in the last 50 years, and in the last 30 years it turned out to be a discipline developing gradually (Hurd, 1997; Sozbilir & Canpolat, 2006). In parallel with this rise, there is an increase in the number of studies on the efficiency of Problem-Based Learning (PBL) in science education both around the world and in our country.

PBL is one of the active learning methods. Students come together with their group members to find alternative solutions to the problems they (might) encounter in daily life. They form hypothesis, to test these hypotheses, they will investigate the sources of information. Thus, they feel responsible from the learning of other group members. Although PBL was originally developed in Case Western Reserve and McMaster Universities' medical school programs in the 1950s, its theoretical foundations date back to the researches of John Dewey (McDonald, 2002).

The theoretical foundations of PBL are based on various learning theories in the literature. Such behavioral theories as Watson's classical and Skinner's operant conditioning work against PBL method. However, such behavioral theories as Thorndike's emphasize the development of learning via feedback, goal setting, comprehension and practice, which are also supported in PBL. Besides, Hull's theory supports PBL which mentions that students should be motivated for attempting to solve an important problem (Savin-Baden & Major, 2004).

As for Savin-Baden and Major (2004), behavioral theory is in conflict with the features of PBL method which deals with complex learning such as improving metacognitive skills. As Yücelis-Alper (2003) report from Schmidt (1983; 1993), the more the new knowledge is connected in itself and with what is learned before, the more functional and permanent the information will be. Problem scenarios facilitate the transfer of information. Also, in associating the new information both within itself and with the previous knowledge, such activities as summarizing, discussing with group members, teaching what is learned to group members and testing the hypothesis, which are all used in finding alternative solutions to problem scenarios in PBL, play an important role (Albanese & Mitchell, 1993; Goodwin, 2006). Van Till, Van Der Vleuten & Van Berkel (1997) state that PBL has many advantages in learning because it encourages lifelong learning and implements the concepts of cognitive learning theories.

According to Savery and Duffy (1995) PBL is a constructivist learning approach which enables students to acquire problem solving and thinking skills that they cannot have with a traditional university education. According to Norman and Schmidt (2000) and Goodwin (2006) the theoretical foundations of PBL are based on the constructivist approach. The two most outstanding features of constructivist approach are as follows: a good problem scenarios and working in cooperation. Good problems enable students to construct knowledge. Besides, it is a good stimulant. Cooperative learning is important because it provides both student-student and teacher-student interaction. As Yasar (1998) reports from Alkove and MacCarty (1992) and Jonasses et al. (1995), in learning environments where constructivist approach is implemented, generally such learning methods as cooperative learning and PBL, which enable students to take more responsibility in learning process and participate effectively, are preferred. Also, in constructivism, teacher does not directly give the information; he/she guides to students while solving problems (Hunt, 1997).

In parallel with the development in science education in the last 30 years, we come up with many implementations of PBL at different grades from elementary school to higher education (Gallagher, Stepien, Sher & Workman, 1995; Peterson & Treagust, 1998; Ram, 1999; Soderberg & Price, 2003; Tosun & Taskesenligil, 2013; Ward & Lee, 2004; Uden & Beaumont, 2006). Systematic review is necessary in guiding people who want to study in this field. There are many guiding studies in the literature, which are designed to respond to the needs of science educators, (Bacanak, Degirmenci, Karamustafaoglu & Karamustafaoglu, 2011; Calik, Unal, Costu & Karatas, 2008; Chang, Chang & Tseng, 2009; De Jong, 2007; Dogru, Gencosman, Ataalkin &

Seker, 2012; Lee, Wu & Tsai, 2009; Sozbilir & Kutu, 2008; Sozbilir, Kutu & Yasar, 2012; Tatar & Tatar, 2008). Besides, there are also national and international meta-analysis studies on the efficiency of PBL and what the problem is related to PBL (Dochy, Seger, Bossche & Gijbels, 2003; Gijbels, Dochy, Bossche & Seger, 2005; Ustun & Eryilmaz, 2012; Yaman, 2012). There are also studies in the literature such as content analysis of research papers related to inquiry-based learning method in science education lately (Kizilaslan, Sozbilir & Yasar, 2012). However, in order to achieve the objectives of these studies, it is important and necessary to make a systematic review at certain intervals .

There are many studies in the literature investigating the efficiency of PBL for different learning results implemented in science education. This situation has brought the need for a systematic review of studies done in this field. This increase in the number of studies causes a mass information bunch for those new researchers, who want to study and for those who already study in the field. It is believed that a descriptive analysis of research theses related to PBL method in science education will help science educators not to be caught up among a mass of information. This descriptive content analysis study will also reflect the existing situation of PBL studies in science education in Turkey.

1.1. Purpose of this study

The aim of this study was to identify what sort of researches are carried out by Turkish science educators about PBL. To this end, 40 theses carried out about PBL in science education between 2001-2012 and obtained from the Council of Higher Education with permission were analyzed in-depth via "*Thesis Classification Form*" and answers to the following questions are looked for:

- What disciplines in master and PhD theses related to PBL are frequently studied by Turkish science educators?
- What subject matters in masters and PhD theses related to PBL are frequently investigated by Turkish science educators?
- What research methods/designs in masters and PhD theses related to PBL are frequently used by Turkish science educators?
- What data collection tools in masters and PhD theses related to PBL are frequently utilized by Turkish science educators?
- What samples and sample size in masters and PhD theses related to PBL are frequently used by Turkish science educators?
- What data analyses methods in masters and PhD theses related to PBL are frequently used by Turkish science educators?

2. Method

This paper presents descriptive content analysis of the PBL studies (Calik & Sozbilir, 2014). Thus organized and detailed analysis of 40 theses, including 28 masters and 12 PhD theses, related to PBL in science education was carried out.

2.1. Data source

Document analysis of 40 theses on PBL in science education in Turkey, which were obtained in full text from the Higher Education Council's Theses Database with permission, was made for this study. While determining the theses on which descriptive analysis was made, the search words "problem-based learning" and "science education" were written as key words on the Higher Education Council's Theses Database. After the research, it was found that there were 6 more theses related to PBL in science education apart from the 40 theses analyzed. However since the full text of these theses could not be accessed, they are not included within this study.

2.2. Data collection tool

"*Paper Classification Form*" developed by Sozbilir, Kutu and Yasar (2012) was used as the data collection tool in this study. This form was revised as "*Thesis Classification Form"* and it included 9 sub-dimensions, which were: the descriptive information of the thesis, the main discipline that thesis belonged to, the subject matters studied, research design/methods, data collection tools, samples and sample size, procedure (development process of PBL scenarios), data analysis methods and techniques and results (advantages and disadvantages of PBL). But collected data of procedure (development process of PBL scenarios) and results (advantages and disadvantages of PBL) are not presented in this paper. In line with the opinions of the experts, there are some small changes carried out about the *"Paper Classification Form"* developed by Sozbilir, Kutu and Yasar (2012). These changes are made in subject matters studied and research design/methods. Because of the majority of masters' and PhD theses done on PBL in Turkey focuses on teaching studies, a more general classification is thought to increase the validity of the study. On the other hand, *"Paper Classification Form"* developed by Sozbilir, Kutu and Yasar (2012) contains 24 different research methods. However, *"Thesis Classification Form"* contains 3 main research approaches (quantitative, qualitative and mixed)

2.3. Data analysis

To ensure the reliability of the study, all theses were separately examined by the authors. Thus, whether there was a high consistency among the examined theses or not was investigated. It was found that there was a consensus among the authors in most of the studies. The small inconsistencies were discussed and agreement was ensured. The data were collected using "*Online Thesis Evaluation Form*" prepared using "Google Drive" program. "*Online Thesis Evaluation Form*" was filled separately for each thesis. This program enabled the data to be presented in an organized way in excel file. And thus, the results were presented through descriptive statistics as graphic, frequency and percentage tables and charts.

3. Results

Studies in which PBL method was used in science education were performed desc-

riptive analysis and findings for each research question are given in order below. While 70.0% of 40 theses were master's theses, 30.0% were PhD thesis (Please see Table 1). While the language of publication was Turkish in 90%, 10% was written in English.

Table1. Descriptive statistics for the theses related to PBL studies in Turkey

Types of the theses	f	%	Language of the theses	f	%
Master's Theses	28	70.0	Turkish	36	90.0
PhD Theses	12	30.0	English	4	10.0

Table 2 is prepared in order to show the development of PBL method in science education in Turkey over the years.

Table 2. Number of theses related to PBL published over years (N=40).

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Master's Theses	1	--	--	1	--	3	5	5	4	7	2	--	28
PhD Theses	--	--	2	1	1	--	3	1	1	2	1	--	12
Total	1	--	2	2	1	3	8	6	5	9	3	--	40

Table 2 indicates that the first thesis on PBL in science education was made in 2001 as a master's thesis (Parim, 2001) at Marmara University, and the second one was accepted in 2003 as a PhD thesis (Yaman, 2003; Yucelis-Alper, 2003) at Ankara University, and Gazi University. Table 2 also shows that Turkish science educators' interest in PBL was very poor until 2006. The trend started increasing from 2006 onwards while it again slowed down towards 2011 as seen in Table 2. It is also seen that the highest number of PhD thesis was in 2007, while the highest number of master's theses was in 2010 and the highest total number of theses was in 2010.

Figure 1 includes classification of the theses according to main discipline it belonged to such as biology, physics, chemistry, science and technology.

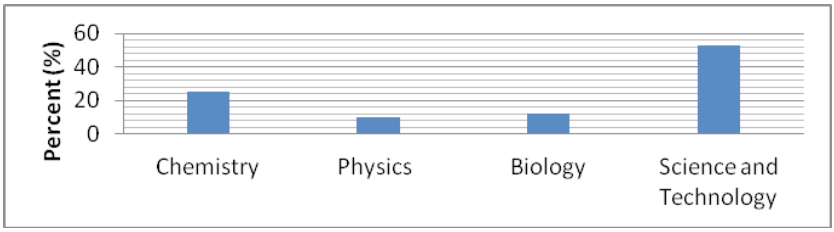

Figure 1. Discipline that thesis belonged

Figure 1 shows that a significant proportion of master's and PhD theses (52.5%) are published in science and technology. Then chemistry is studied in 25.0% of the theses followed by biology (12.5%) and physics (10%), respectively.

Table 3 includes which units were covered in the theses on PBL in science education and for which level of students the PBL scenarios developed for these implementations were examined.

Table 3. Units that developed PBL scenarios and grade levels

Grade level	Units	Master's Theses (f)	PhD Theses (f)	Total (f)
Primary (grade 4 and 5)	Light and sound	2	---	2
Primary (grade 5) & Undergraduate (grade 3)	Heat and temperature	1	1	2
Primary (grade 6)	Electricity in the lives	1	---	1
Primary (grade 6 and 7) & Undergraduate (grade 2)	Force and motion	2	1	3
Primary (grade 6)	Substance and heat	1	---	1
Primary (grade 6)	Structure of matter	1	---	1
Primary (grade 6)	Directing our lives electricity-stationary electric	1	---	1
Primary (grade 7)	Pressure	---	1	1
Primary (grade 7)	Journey to the internal structure of matter	1	---	1
Primary (grade 7)	Why ecosystems are changing?	1	---	1
Primary (grade 7)	Human and environmental	1	---	1
Primary (grade 7)	Our body systems: digestive, urinary, nervous and endocrine glands	1	---	1
Primary (grade 8)	The concept of DNA-chromosome-gene	1	---	1
Primary (grade 8)	Genetic	2	---	2
Primary (grade 8)	Heredity	1	---	1
Primary (grade 8)	Force, motion, fluid buoyancy and swimming	1	---	1
Secondary (grade 9)	Viruses and bacteria	---	1	1
Secondary (grade 9)	Mixtures	1	---	1
Secondary (grade 9)	Reproduction, growth and development	---	1	1
Secondary (grade 9)	Excretion	---	1	1
Secondary (grade 9)	Endocrine systems	1	---	1
Secondary (grade 9)	Moving on the earth	1	---	1
Undergraduate (grade 1)	Solutions and their physical properties	---	1	1

Grade level	Units	Master's Theses (f)	PhD Theses (f)	Total (f)
Undergraduate (grade 1)	Gases	---	1	1
Undergraduate (grade 1)	Acids and bases	---	1	1
Undergraduate (grade 1)	Mechanical work and energy	1	---	1
Undergraduate (grade 1)	Simple electric circuits	1	---	1
Undergraduate (grade 1 and 2)	Newton's laws of motion	1	---	1
Undergraduate (grade 3)	Solids	---	1	1
Undergraduate (grade 3)	Thermodynamics 1 law	---	1	1
Undergraduate (grade 3)	Stubble fires, the ozone layer and environmental problems caused by motor vehicles	1	---	1
Undergraduate (grade 3)	Biological diversity, ecology, ecosystem	1	---	1
Undergraduate (grade 3)	Water hardness	1	---	1
Undergraduate (grade 3)	Physical laboratory experiments	1	---	1
Undergraduate (grade 4 and 5)	Renewable energy and provision of this energy	---	1	1
Total		28	12	40

According to Table 3, PBL scenarios in science education (physics, chemistry, biology, science and technology) were prepared for all ages from 4th grade to senior students at university, and various practices were made. Besides, according to Table 3*, "Force and Motion*" unit was the most preferred unit and its implementation was made at the 6th and 7th graders as well as sophomore university students at both master's and doctoral level.

The majority of masters' and PhD theses on PBL in Turkey focuses on teaching studies (97.5%). Other subject studied is environmental education issues (2.5%). When the fact that studies on PBL in science education in Turkey, in which subject matter is chosen as teaching, form almost all the studies examined, Table 4 is made to detail which sub-subjects are looked into in these studies. While preparing Table 4, the co-examination of different sub-subjects of teaching in the same theses is considered.

Table 4. Frequently investigated subject matter of teaching

Subject matter		f	%
Teaching	The effect of teaching on students' academic achievement	35	87.5
	The effect of teaching on students' attitudes	25	62.5
	The effect of teaching on students' scientific process skills	22	55.0
	Comparison of teaching methods	3	7.5

According to Table 4, the effect of teaching on achievement was investigated in 87.5% of the theses among 40 thesis on PBL done by science educators in Turkey, while in 62.5%, the effect of teaching on attitude was investigated and in 55% the effect of teaching on scientific process skills was investigated. In addition, in 7.5% of the theses examined, teaching methods were compared. This shows that one of the two thesis in Turkey on science education, the effect of teaching on achievement, attitude and scientific process skills were investigated all at once.

Preferred research methods in theses on PBL in science education are given in Figure 2. In studies on PBL in science education, which were subjected to descriptive analysis, it is seen that qualitative research methods are not as much preferred as quantitative methods. According to Figure 2, quantitative research methods are preferred in 95.0% of all the theses while qualitative research methods are only preferred in 5% of the theses And it is seen that in master's and PhD theses on PBL in science education in Turkey, mixed research methods are not preferred.

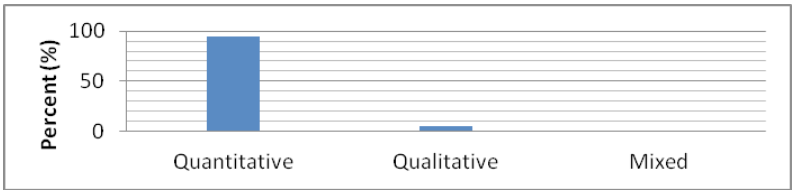

Figure 2. Frequently used research design/methods on PBL in science education in Turkey

It is understood that quasi-experimental research among quantitative research methods is the most highly preferred method in the theses with a ratio of 85.0%. In addition, pre-experimental research, one of the quantitative research methods, is preferred in 10.0% of the theses; and action research, one of the qualitative research methods, is preferred in 5% of the theses. This shows that events that can be observed and assessed by the researchers are preferred more. Besides, this shows that science educators studying PBL in science education do not prefer non-experimental design among quantitative research methods; non-interactive design among qualitative research methods; exploratory, explanatory and triangulation designs among mixed research methods.

Frequently preferred data collection tools in theses on PBL in science education are given in Table 5. While forming Table 5, using more than one data collection tools in one study is considered.

Table 5. Types of data collection tools

Type of data collection tools	f	%	Type of data collection tools	f	%
Achievement tests	39	97.5	Alternative assessment tools	6	15.0
Questionnaires	17	42.5	Aptitude, attitude, perception, personality etc. tests	33	82.5

Type of data collection tools	f	%	Type of data collection tools	f	%
Interviews	9	22.5	Other data collection tools	1	2.5
Observations	5	12.5			

According to Table 5, an achievement test was used in 97.5% of the theses on PBL in science education while such scales as aptitude, attitude, perception, personality etc. tests were used in 82.5% and questionnaires were used in 42.5%, interviews were used in 22.5%, alternative evaluation tools were used in 15.0%, observation was used in 12.5% and a test consisting of open-ended questions, aiming to define the concept construction levels of students, were used in 2.5% of the theses.

Using thesis classification form, it was identified what type of questionnaires, used as data collection tools, were preferred and what kind of questions achievement tests included. Also, the sort of observations and interviews made were also included in this study. In 13 out of 17 theses in which questionnaires were used as data collection tools, Likert-type questionnaires were used while open-ended questionnaires were preferred in 5 of them. In 34 theses out of 39, in which achievement test was used, multiple choice questions were preferred while in 12 of them open-ended questions were used, and in 1 short-answer and true-false questions grouped as "other" were preferred. In all 9 theses in which interview was used as data collection tool, semi-structured interview was used while in all 5 theses in which observation was used, nonparticipant observation was preferred.

In Table 5, it is shown that in 82.5% of thesis whose descriptive analysis was made, aptitude, attitude, perception, personality etc. tests were preferred as data collection tools. In order to detail which tests are preferred in these studies, Table 6 was made. While forming Table 6, the use of more than one aptitude, attitude, perception, personality etc. tests was considered. In 33 of the 40 theses whose descriptive analysis was made; aptitude, attitude, perception, personality etc. tests were used. According to Table 6, in these 33 theses a total number of 48 aptitude, attitude, perception, personality etc. tests were used. In 50% of these studies, an attitude scale was applied to determine the attitudes of students towards physics, chemistry, biology and science and technology courses, while in 27.1% a scientific processing skill test, in 6.3% a creativity test, in 4.2% rational thinking skills test, problem solving skills attitude scale and motivation scale towards science teaching and in 2.1% self-efficacy belief scale and inquiry learning skills perception scale was used.

Table 6. Frequently used aptitude, attitude, perception, personality etc. tests

Aptitude, attitude, perception, personality etc. tests	**f**	**%**
Attitude scale (to determine the attitudes of students towards chemistry, physics, biology and science and technology courses)	24	50.0
Scientific processing skill test (mechanical issues)	13	27.1
Creativity test (creative thinking in figure test, Torrance test of creative thinking)	3	6.3
Rational thinking skills test	2	4.2
Problem solving skills attitude scale (physics lesson)	2	4.2

Aptitude, attitude, perception, personality etc. tests	f	%
Motivation scale towards science teaching (science teaching and chemistry)	2	4.2
Self-efficacy belief scale	1	2.1
Inquiry learning skills perception scale	1	2.1
Total	48	

In Figure 3, the frequency of data collection tools preferred by science educators is given. In 10% of the theses examined, a single type data collection tool was used. Two data collection tools were used in 37.5% of the theses, three data collections tools were used in 35% of the theses and four data collection tools were used in 17.5% of the theses.

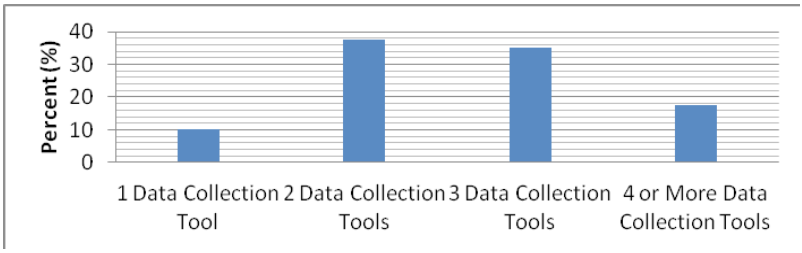

Figure 3. The number of different data collection tools

Frequently preferred samplings in PBL theses are given in Figure 4. It is understood that in 40.0% of the theses, undergraduate students were preferred as sample while in 37.5% primary school students (6-8 graders) were preferred and in 15.0% secondary school students (9-12 graders) and in 7.5% primary school students (1-5 graders) participated. No theses on PBL in science education in Turkey, in which preschool, teachers, administrators and parents were chosen as sample, were found.

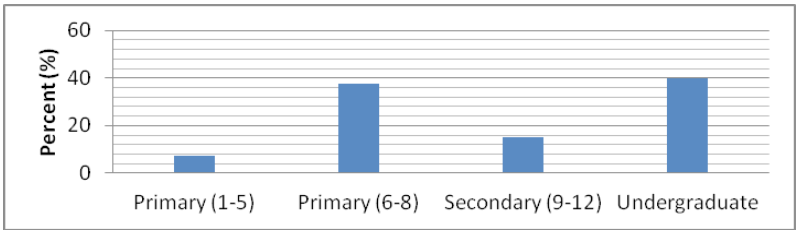

Figure 4. Frequently used sample in PBL theses in Turkey

Figure 5 was made about the size of the samples. Results show that most commonly selected sample sizes were 31 to 100 participants (77.5%) and 101 to 300 participants (15%) and 11 to 30 participants (7.5%). The smallest sample size among these theses was made with the participation of 15 students (e.g. Kumas, 2008) and the biggest sample size included 220 participants (e.g. Yaman, 2003).

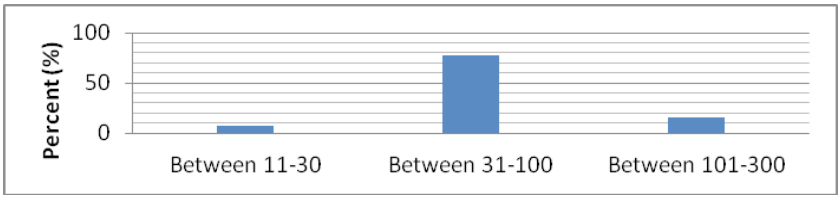

Figure 5. Frequently used sample sizes

Frequently preferred data analysis methods in masters and PhD theses whose descriptive analysis was made are given in Table 7. While making Table 7, the fact that more than one data collection tools can be used in one study was considered, so the percentages are calculated according to the total number of data analysis methods used in the theses.

According to Table 7, descriptive and inferential statistics are the most frequently used methods; however the percentage of use of descriptive statistics (58.1%), is slightly higher than inferential statistics (34.5%). Quality descriptive analysis method, one of the qualitative data analysis methods, was used in 7.3% of the theses. In studies whose descriptive analysis was made, frequency/percentage tables were preferred in 24.2% of the theses, average/standard deviation was preferred in 23.6%, t-test in 18.2% and graphics in 9.1% and ANOVA/ANCOVA and qualitative descriptive analysis methods were preferred in 7.3% of the theses.

Table 7. Frequently used data analysis methods and techniques (N=40)

			f	%
QUANTITATIVE ANALYSIS	Descriptive statistics (%58.1)	f / % tables	40	24.2
		Central tendency measures	39	23.6
		Charts	15	9.1
		Others	2	1.2
	Inferential statistics (%34.5)	t-test	30	18.2
		ANOVA/ANCOVA	12	7.3
		MANOVA/MANCOVA	6	3.6
		Factor analysis	1	0.6
		Correlation	2	1.2
		Regression	---	---
		Non-Parametric Tests	6	3.6
QUALITATIVE ANALYSIS	Qualitative analysis (%7.3)	Content analysis	---	---
		Descriptive analysis	12	7.3
		Others	---	---
		Total	165	100

Figure 6 shows the number of data analysis methods preferred in one study in masters and PhD theses on PBL in science education. In Figure 6, it is seen that there are two

different data analysis methods highly preferred in the studies whose descriptive analysis was made. This rate is 75.0%. It is also seen that in 25.0% of all theses, three different data analysis methods were preferred. There are no theses carried out with only one data analysis method.

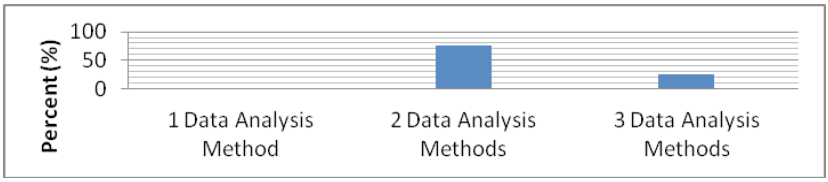

Figure 6. Frequently used data analysis methods and techniques

4. Discussion and Suggestions

This descriptive content analysis study aimed to identifying the current status of masters and PhD theses on PBL in Turkey. To this end, descriptive analysis was carried out on a total number of 40 theses on PBL in science education made between the years 2001- 2012 and obtained from the Council of Higher Education's thesis database in full text with permission.

It could be suggested that Turkish science educators' interest in PBL remained low until 2006. Theses show an increasing trend from 2006 onwards while it slows down again towards 2011. The reason behind the decrease in 2011 could be the fact that the full texts of masters and PhD theses on PBL in science education accepted in 2011 and 2012 are not open for access in the Council of Higher Education's thesis database or because uploading of those theses is not complete yet.

It is seen that studies on science and technology are preferred in one study in every two studies in masters and PhD theses on PBL in science education. This is because teachers place significant emphasis on graduate education in Turkey especially in the last years. In order to complete their graduate study, our teachers prefer studies which examine the efficiency of such teaching methods (such as PBL) on different learning products.

It is also seen that the PBL practices on science education were mostly done with undergraduate and primary school (6-8 graders) students and that "*Force and Motion*" unit was the most preferred unit. And the fact that preschool, teachers, administrators and parents are not chosen as samples in any theses can be regarded as a deficiency of theses on PBL in science education in Turkey. In most of the theses on PBL, on the other hand, it is seen that the sample size is made up of 31-100 participants. These findings are in compliance with the findings of the studies by Sozbilir, Kutu & Yasar, (2012). This could be because teachers working for The Ministry of National Education and the research assistants at universities prefer purposeful sampling and convenience sampling methods, which are among non-random sampling methods, in their graduate studies. While choosing convenience sampling method, the people or groups who are easily accessible were preferred (Johnson & Christensen, 2004).

The first studies on science education started with the changes in the curriculum and

later the emphasis was put on studies to learn science concepts. Later, studies related to private education methods have been the center of attention for the researchers. Although PBL studies, which has been implemented in the last 10-15 years for science educators in Turkey, is not a new teaching method, it is seen that almost in all theses done, quasi-experimental designs, which are among quantitative research designs, are preferred. The reason of that could be that achievement test, aptitude, attitude, perception, personality etc. tests and questionnaires were preferred more as data collection tools in theses towards determining the efficiency of teaching. This is in compliance with the findings of the content analysis made by Kizilaslan, Sozbilir & Yasar, (2012) on inquiry-based learning.

In this study, it is seen that in one of every two theses on PBL in science education in Turkey, the effect of teaching on achievement, attitudes and scientific process skills is examined at the same time; and that achievement, aptitude, attitude, perception, personality etc. tests and questionnaires are preferred more as data collection tools. It is also seen that interview, observation and alternative evaluation tools are not used a lot. According to Gijbels, Watering & Dochy, (2005) evaluation can be included in the properties on the basis of PBL method. However, alternative assessment tools are not preferred a lot in theses on PBL in science education in Turkey, and product-based assessment methods made via achievement test are used instead. Turkish science educators neglect process-based evaluations, a basic characteristic of PBL, in their PBL practices (Nendaz &Tekian, 1999).

The most important function of today's societies is to educate students who can provide alternative solutions to the problems they face in everyday life and who has a sense of responsibility. In addition, it is necessary to increase the interest and achievement of students in science course and to educate scientifically literate individuals. It is revealed in many studies that PBL is efficient in accomplishing these aims. An overall perspective is provided for Turkish science educators on PBL studies with the results of this descriptive analysis.

5. References

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Appendix 1. The List of the Master's and PhD Theses about PBL

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