International Journal on New Trends in Education and Their Implications
October 2013 Volume: 4 Issue: 4 Article: 13 ISSN 1309-6249

THE RELATIONSHIP BETWEEN PROSPECTIVE PRIMARY MATHEMATICS TEACHERS' ATTITUDES TOWARDS PROBLEM-BASED LEARNING AND THEIR STUDYING TENDENCIES

Assist. Prof. Dr. Gülşah BATDAL KARADUMAN
Istanbul University, Hasan Ali Yucel Educational Faculty
Department of Primary Education, Istanbul, TURKEY

ABSTRACT

Problem-based learning (PBL), aims students to gain autonomous learning, independent study, inquisition and problem-solving skills; and it is an approach in which individuals are confronted with simulated situations like the ones they are probable to face in their daily lives and encouraged to learn individually through self-study and research. This method being used in mathematics classes has an importance for the permanent storage of knowledge. One other factor which affects the students' learning is their efficient and proper way of study. This study, which aimed to investigate the relationship between prospective primary mathematics teachers' attitudes towards problem-based learning and their studying tendencies, was conducted with 100 students who study at mathematics teaching discipline of primary education department of Hasan Ali Yücel Faculty of Education, Istanbul University. The Scale of Problem-Based Learning Attitude which was developed by Turan & Demirel (2008) and the Scale of Study Process which was adapted to Turkish language by Yılmaz & Orhan (2011) has been applied in this study. In this study a parallel relationship is determined between the prospective primary mathematics teachers' attitudes towards problem-based learning and approaches to the lesson study.

Key Words: Problem-based learning, approaches to studying, mathematics education.

INTRODUCTION

Being called as "problem-based learning" in English, this approach can be named as "problem temelli öğrenme, probleme dayalı öğrenme, problem temelli öğretim, probleme dayalı öğretim" in Turkish. (Kılınç, 2007). Problem-based learning (PBL), which aims students to gain autonomous learning, independent study, inquisition and problem-solving skills, is an approach in which individuals are confronted with simulated situations like the ones they are probable to face in their daily lives and encouraged to learn individually through self-study and research. (Özdemir, 2003; Plucker, 1999, akt. Turan, Demirel, 2008). Problem-based learning strategy puts the 'problem' in the center, from teaching objectives to students' behaviors and from teaching methods and techniques to testing and assessment processes. That is why; learning objectives and behaviors have to be defined beforehand in such an approach. After these stages are determined, the methods and techniques to be used need to be fixed (Kılınç, 2007).

In PBL session, what is conducted in small groups is a teaching method in which the development of overall skills and behaviors are connected with knowledge acquisition. PBL group consists of a student group of 8 to 10 and a tutor who enables learning easier for them. PBL has four elements: problem or scenario, tutoring leader, student and evaluation. PBL is carried out thorough a pre-formed scenario and its success depends on the quality of the scenario. (Wood, 2003, akt. Turan, Demirel, 2008). The scenario is often chosen out of real life problems. The scenarios or the problems need to be suitable for the students' background knowledge. (Yaman, Yalçın, 2005). Evaluation in PBL includes revising the projects and scenarios so that they provide meaningful learning situations for the students, supporting permanent storage of knowledge and transfer, developing reflection; and making it possible to use knowledge and skills properly (Bridges and Hallinger, 1995, akt. Turan, Demirel, 2008).

Two important factors in the performance of PBL are the teacher and the student. PBL demands dramatic changes in the behaviors and roles of both groups. The most important role of the teacher is to make learning easier. His role is much different than what is accustomed as a teacher's duty. He guides the students and leads them to gather information about this field (Turan, Demirel, 2008). PBL is a student-centered process. Students take the role of solving the problem in problem-based learning process. Group members gain the ability to work in groups and learn through collaborative work while working in groups so as to solve the problem and learn it (Turan, Demirel, 2008). As the first step of PBL approach is a problem which is necessary to be solved, students who work in PBL environment need to have well-developed problem-solving and critical thinking abilities (Yaman, Yalçın, 2005). PBL provides students with a sophisticated and deep point of view to cases. It improves students' advanced thinking and listening skills (critical thinking skills, scientific thinking skills etc.) (Kaptan, Korkmaz, 2001).

So as the programs in which PBL is used to be successful, teachers and students who have an important role in the process should work collaboratively. The data gathered via the attitudes and views of students and teachers about the program are also important as feedback for the development of the program (Turan, Demirel, 2008). In this aspect, being aware of the students' attitudes towards studying is important for the success of the program.

Basic principles of effective study skills are studying with the frame of a defined program by concentrating, studying systematically and regularly, persisting until finishing the work completely, keeping the pace with one's peers (Uluğ, 1981, akt. Temelli, Kurt, 2010). According to the studies done on students' techniques of studying; effective studying processes, the quickness in completing an assignment, positive opinions about the teacher, internalizing objectives of the lesson, the effort to make sense of the subjects learnt, the desire to be successful academically and fear of failure (Entwistle, McCune, 2004, akt. Yılmaz, Orhan, 2011).

Within this context, one other topic is the aim of the students in the learning environment during learning activity; while some students set off in order to catch on every single subject being learned, some others would participate in the learning activity for the only reason of passing exams. It was found out that the learners process knowledge in two levels as sophisticated and superficial (Yılmaz, Orhan, 2011).

Learning approaches mean the aim to learn a specific point and the varieties of the activities to be chosen; and they include the strategies that learners use during studying and the reasons why they choose these strategies. In this sense, individuals choose either "sophisticated learning" or "superficial learning". If they understand the subjects at higher level, it means that they adopt sophisticated learning; if their understanding is at lower level, it means that they have superficial learning style (Ozan, Köse, Gündoğdu, 2012).

The studies conducted by Trigwell and his friends (1999, akt. Yılmaz, Orhan, 2011) show that student- centered teaching has a relation with sophisticated learning approach and teacher-centered teaching is related to superficial learning approach. If a learning material is attractive enough, the basis for a sophisticated learning can be established. From this point of view, teachers should provide student-centered and interactive teaching environments for an effective learning; identify the students who have superficial study tendencies and take precautions to make them use the strategies which can be defined as a part of sophisticated learning (Yılmaz, Orhan, 2011). People can only be happy in an ergonomic learning environment which they love and be happy in. Students' studying in a suitable environment is as important as their having effective studying skills (Bay, Tuğluk, Koçyiğit, 2006). Being one of the methods which provide such kind of suitable environments, PBL enables effective learning.

The identification of which approach the students choose from sophisticated and superficial ways is believed to help to form effective teaching environments. By this way, foundations for the superficial learners to become sophisticated ones will be laid (Yılmaz, Orhan, 2011). Defining the studying approach that PBL supports will have an effect on the rise of students' success.

METHOD

In this study, adopted method is descriptive approach which allows detecting the present condition of a specific topic. It was conducted in 2012-2013 academic year in Hasan Ali Yücel Faculty of Education. The Scale of Problem-Based Learning Attitude which was developed by Turan & Demirel (2008) and the Scale of Study Process which was adapted to Turkish language by Yılmaz & Orhan (2011) has been applied to 100 students who study at mathematics teaching discipline of primary education department of our faculty and the results have been analyzed.

Universe And Sample

Universe is the students who study at Primary Teaching Department of Hasan Ali Yücel Faculty of Education. As these students are about to graduate, they are also prospective teachers at the same time. Sample is 100 students who study at mathematics teaching discipline of primary education department, Hasan Ali Yücel Faculty of Education, Istanbul University.

Data Collection Tools

The Scale of Problem-Based Learning Attitude which was developed by Turan & Demirel (2008) consists of 20 items of whose every single item includes 5 options in Likert type. A range of points from 1 to 5 was developed; each item was graded with an attention to positive and negative expressions so that 5 points mean the positive behavior. With its initial form, 60x5=300 points is the highest and 60x1=60 is the lowest point which can be achieved.

The Scale of Study Process which was adapted to Turkish language by Yılmaz & Orhan (2011) is an adapted version of Study Process Questionnaire which was developed by Biggs in 1987. After a while, this scale was revised in 2001 and a new scale with two factors including 20 items was developed. For the options of items in the scale, a Likert scale rating system was used and the options followed as " never or occasionally true for me (1)", "sometimes true for me (2)", "half true for me (3)", "most of the time true for me (4)", "always or almost always true for me (5)" (Biggs, Kember ve Leung, 2001, akt. Yılmaz, Orhan, 2011). By this way, the score students can get for sophisticated and superficial approaches changes from 10 to 50 points. We can decide which approach the student adopts by looking at the results of this grading.

Data Analysis

Descriptive statistics was used for the analysis of data. All the statistical processes were dealt with SPSS (Statistical Packet for Social Sciences); for the evaluation of data, Independent Group t Test, One-Direction Analysis of Variance (ANOVA) and Pearson Multiple Correlation Analysis techniques were used; and the findings were presented in accordance with the aims of this study.

RESULTS AND CONCLUSIONS

After analysis of collected data, the findings are presented under the headings of the table according to the order of purpose.

Table 1: The Results of Pearson Multiple Moment Correlation Analysis Conducted in order to see the Relation between the Answers of Mathematics Education Students to the Sophisticated Studying Approach and Their Answers to Superficial Studying Approach

	Total Points for the Sophisticated Studying Approach	Total Points for the Superficial Studying Approach
Total Points for the Sophisticated Studying Approach	X=30,3100 SS=6,25501 N=100	r=-0,184
Total Points for the Superficial Studying Approach	p=0,067	X=27,2800 SS=6,98784 N=100

As can be seen in Table-1, no meaningful statistical relationship between the points could be found as a result of Pearson Multiple Moment Correlation Analysis conducted in order to see the relation between the answers of mathematics education students to the sophisticated studying approach and their answers to superficial studying approach. What can be understood from the answers is that students give higher points to sophisticated studying approach which means they adopt this approach more.

Table 2: The Results of Pearson Multiple Moment Correlation Analysis Conducted in order to see the Relation between the Answers of Mathematics Education Students to the Sophisticated Studying Approach and Their Answers to Problem-based Learning Attitude Scale

	Total Points for the Sophisticated Studying Approach	Total Points for Problem-based Learning Attitude Scale
Total Points for the Sophisticated Studying Approach	X=30,3100 SS=6,25501 N=100	r=0,066
Total Points for Problem-based Learning Attitude Scale	p=0,511	X=59,4400 SS=4,98952 N=100

As can be seen in Table 2, no meaningful statistical relationship between the points could be found as a result of Pearson Multiple Moment Correlation Analysis conducted in order to see the relation between the answers of mathematics education students to the sophisticated studying approach and their answers to Problem-based Learning Attitude Scale.

Table 3: The Results of Pearson Multiple Moment Correlation Analysis Conducted in order to see the Relation between the Answers of Mathematics Education Students to the Superficial Studying Approach and Their Answers to Problem-based Learning Attitude Scale

	Total Points for the Superficial Studying Approach	Total Points for Problem-based Learning Attitude Scale
Total Points for the Superficial Studying Approach	X=27,2800 SS=6,98784 N=100	r=0,240 (*)
Total Points for Problem-based Learning Attitude Scale	p=0,016	X=59,4400 SS=4,98952 N=100

As can be seen in Table 3, no meaningful statistical relationship between the points could be found as a result of Pearson Multiple Moment Correlation Analysis conducted in order to see the relation between the answers of mathematics education students to the superficial studying approach and their answers to Problem-based Learning Attitude Scale.

Table 4: The Results of Independent Group t Test Conducted in order to see if the sex variable has an Influence on the Points of the Students' Answers to Problem-based Learning Attitude Scale

Point	Groups	N	Average	SS	$Sh_{\bar{x}}$	t Test		
						t	*Sd*	p
Problem-based Learning Attitude Scale	Female	73	59,2329	5,01808	,58732	-0,681	98	0,498
	Male	27	60,0000	4,96139	,95482			

As can be seen in Table 4, no meaningful statistical relationship between the arithmetic averages of the groups could be found as a result of Independent Group t Test conducted in order to see if the sex variable has an influence on the points of the students' answers to problem-based learning attitude scale.

Table 5: The Results of Independent Group t Test Conducted in order to see if the sex variable has an Influence on the Points of the Students' Answers about Sophisticated Studying Approach

Point	Groups	N	Average	SS	$Sh_{\bar{x}}$	t Test		
						t	*Sd*	p
Total Points for the Sophisticated Studying Approach	Female	73	30,3151	6,51041	,76199	0,013	98	0,989
	Male	27	30,2963	5,62149	1,08186			

As can be seen in Table 5, no meaningful statistical relationship between the arithmetic averages of the groups could be found as a result of Independent Group t Test conducted in order to see if the sex variable has an influence on the points of the students' answers about sophisticated studying approach.

Table 6: The Results of Independent Group t Test Conducted in order to see if the sex variable has an Influence on the Points of the Students' Answers about Superficial Studying Approach

Point	Groups	N	Average	SS	$Sh_{\bar{x}}$	t Test		
						t	*Sd*	p
Total Points for the Superficial Studying Approach	Female	73	26,9315	7,36042	,86147	-0,819	98	0,415
	Male	27	28,2222	5,88566	1,13270			

As can be seen in Table 6, no meaningful statistical relationship between the arithmetic averages of the groups could be found as a result of Independent Group t Test conducted in order to see if the sex variable has an influence on the points of the students' answers about superficial studying approach.

No meaningful statistical relationship between the arithmetic averages of the groups could be found as a result of One-Direction Analysis of Variance (ANOVA) conducted in order to see if the students' graduate high schools have an influence on the points of the students' answers to problem-based learning attitude scale. Likewise, no meaningful statistical relationship between the arithmetic averages of the groups could be found as a result of One-Direction Analysis of Variance (ANOVA) conducted in order to see if the students' graduate high schools have an influence on the points of the students' answers about sophisticated and superficial studying approaches.

CONCLUSION AND DISCUSSION

In the classes where PBL model is used, students gradually take more responsibilities about their own learning and they continue their lives as independent individuals of life-long learning. At this point, teacher does not take the conventional role of transmitting knowledge; instead, he also goes on learning with the students, makes learning easier for the students and encourages them (Kaptan, Korkmaz, 2001, akt. Kılınç, 2007). While students gather knowledge only by listening to the teacher's lectures in the conventional style, they acquire knowledge more permanently by researching, observing, trying, interacting with the outer world in PBL. Not only the students get information about certain topics, but they also acquire such skills as guessing, criticizing, working in groups, collecting data and analyzing all of which will be useful in their whole life (Şenocak, Taşkesenligil, 2005). Students who have acquired or want to acquire these skills adopt sophisticated study approach. The results of this study support this argument. It is found that students who have positive attitudes towards Problem-based Learning agree on the approach of sophisticated study at a higher level.

When the scaling results of a study leaded by Köroğlu and Yeşildere (2004) are generally examined, it was found that students who cover the unit by oral presentation cannot exactly reach the notions and they use memorization while solving problems. And it could be clearly seen that students in this sample were more successful, could make relations between notions and match them with different areas in real life thanks to a mathematics teaching approach which includes student-centered teaching and multiple intelligence. It can be

concluded that PBL approach has a positive effect on the students' attitudes towards mathematics and their level of success (Cantürk Günhan, Başer, 2008). Prospective teachers' attitudes should be observed and an education should be designed accordingly so that they can teach mathematics in the most effective way.

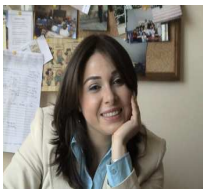
No meaningful statistical relationship between the arithmetic averages of the students' learning attitudes and the sex variable. When Ozan, Köse and Gündoğdu (2012) observed the students' learning approaches according to the sex variable, they found a meaningful difference only in superficial learning approaches part. On the other hand, for sophisticated and strategic learning parts, no meaningful relation was observed between girls and boys. It was seen that male students choose superficial learning approach to a considerable extend when compared to girl students. Senemoğlu (2011) also observed the students' learning approaches according to the sex variable; and she found a meaningful difference in superficial and strategic learning approaches. She concluded that female students choose superficial and strategic learning approaches to a considerable extend when compared to male students. Senemoğlu (2011) could reach no meaningful result in terms of the relation between American students' learning approaches and their genders. Sezgin-Selçuk, Çalışkan and Erol (2007) could not reach any meaningful results in terms of the relation between prospective physics teachers' learning approaches and their genders, either.

These suggestions can be made with the light of the results of this study:

- ✓ Learning environments which will encourage students to choose sophisticated learning approaches more can be enhanced.
- ✓ It might be useful that this study is conducted again with different samples.
- ✓ Some other studies can be done so as to show that students of education faculties can develop sophisticated learning approach with methods other than problem-based learning approach.
- ✓ Experimental studies can be done by creating various learning environments to observe their effects on studying approaches.
- ✓ Students' learning and studying approaches should be defined and lessons for the teaching of these approaches should be included in the programs, seminars and workshops should be organized.

IJONTE's Note: This article presented at 5. International Congress Educational Research: Peace, Memory and Educational Research, Çanakkale –Turkey.

BIODATA AND CONTACT ADDRESS OF AUTHOR



Assist. Prof. Dr. Gülşah BATDAL KARADUMAN currently employed as an Assistant Professor at Istanbul University, Hasan Ali Yücel Faculty of Education, Department of Mathematics Education and Primary School Teacher Training Program. She is specifically interested in gifted education, creativity, creativity in mathematics, approaches and techniques of teaching, curriculum evaluation, individual differences in learning, the teaching of mathematics, learning of mathematics, creative drama, and spatial intelligence.

Assist. Prof. Dr. Gülşah BATDAL KARADUMAN
Istanbul University,
Istanbul University, Hasan Ali Yücel Faculty of Education
Department of Primary Education, Istanbul, TURKEY
Tel: 0 212 440 00 00
E. Mail: gulsah@istanbul.edu.tr

REFERENCES

Bay, E., Tuğluk, M. N., Koçyiğit, S. (2006). *Sosyal Bilimler Enstitüsü Dergisi*, Cilt 8, Sayı 2, 211-224

Cantürk Günhan, B., Başer, N. (2008). Probleme Dayalı Öğrenme Yönteminin Öğrencilerin Matematiğe Yönelik Tutumlarına Ve Başarılarına Etkisi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi,* Cilt: 8, Sayı: 1, Yıl: 8, 119-134

Kaptan, F ve H. Korkmaz (2001). Fen Eğitiminde Probleme Dayalı Öğrenme Yaklaşım. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*. 20, 191-192

Kılınç, A. (2007). Probleme Dayalı Öğrenme. *Kastamonu Eğitim Dergisi*. Cilt 15, Sayı 2, 561-578.

Köroğlu, H., Yeşildere, S. (2004). İlköğretim Yedinci Sınıf Matematik Dersi Tamsayılar Ünitesinde Çoklu Zeka Teorisi Tabanlı Öğretimin Öğrenci Başarısına Etkisi. *Gazi Eğitim Fakültesi Dergisi*, Cilt 24, Sayı 2, 25-41

Ozan, C., Köse, E., Gündoğdu, K.(2012). Okul Öncesi ve Sınıf Öğretmenliği Öğrencilerinin Öğrenme Yaklaşımlarının İncelenmesi. Eğitim Bilimleri Araştırmaları Dergisi Uluslar arası E-Dergi. Cilt: 2, Sayı: 2, 75-92.

Senemoğlu, N. (2011). College of education students' approaches to learning and study skills. *Education and Science*, 36 (160), 65-80.

Sezgin-Selçuk, G., Çalışkan, S. & Erol, M. (2007). Fizik öğretmen adaylarının öğrenme yaklaşımlarının değerlendirilmesi. *Gazi Eğitim Fakültesi Dergisi*, 27 (2), 25-41.

Şenocak, E., Taşkesenligil, Y. (2005). Probleme dayalı Öğrenme ve Fen Eğitiminde Uygulanabilirliği. *Kastamonu Eğitim Dergisi*. Cilt 13, Sayı 2, 359-366.

Temelli, A., Kurt, M. (2010). Eğitim Fakültesi ve Fen Fakültesi Biyoloji Öğrencilerinin Ders Çalışma Alışkanlıklarının Farklı Değişkenler Açısından İncelenmesi. *Kuramsal Eğitimbilim*, 3 (2), 27-36

Turan, S., Demirel, Ö. (2008). The Reliability and Validity of the Attitude Scale Towards Problem-Based Learning, *AMEE (An International Association for Medical Education in Europe) Konferansı Bildiri Kitabı*. s. 69

Yaman, S., Yalçın, N. (2005). Fen Bilgisi Öğretiminde Probleme Dayalı Öğrenme Yaklaşımının Yaratıcı Düşünme Becerisine Etkisi. *İlköğretim-Online*, 4(1), 42-52.

Yılmaz, B., Orhan, F. (2011). Ders Çalışma Yaklaşımı Ölçeği'nin Türkçe Formunun Geçerlik ve Güvenirlik Çalışması. *Eğitim ve Bilim Dergisi*. Cilt 36, Sayı 159.