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RESEARCH ARTICLE

ANALYSIS OF THE EFFECT OF PREDICTION-OBSERVATION-EXPLANATION AND INQUIRY-BASED LEARNING METHODS ON SCIENTIFIC PROCESS SKILLS AND CRITICAL THINKING DISPOSITION OF PRESERVICE SCIENCE TEACHERS IN GENERAL PHYSICS LABORATORY

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ABSTRACT

The aim of study is to determine the effect of Prediction-Observation-Explanation (POE) and inquiry based learning methods which were applied in General Physics Laboratory 1 for science Teaching 1st class pre-service teachers. The sample is composed of 55 people, 27 of them in Group 1, 28 people in Group 2, all of whom are Science Education department students receiving the course of General Physics Laboratory. The model of this study is experimental pattern without pre and post-test control group. Group 1 was applied POE method, group 2 was applied Inquiry-based Learning method. Data of the study was collected with California Critical Thinking Tendency Scale and Scientific Process Skills Test. As a result of the study, while there was no statistically significant difference in scientific process skills of pre-service teachers who are applied with POE method in laboratory courses, there was statistically significant development in curiosity sub-dimension of critical thinking tendencies. In laboratory courses applied with Inquiry-based Learning method, there was statistically significant difference in scientific process skills and curiosity sub-dimension of critical thinking tendencies.

INTRODUCTION

Physics is the field of science which analyzes how natural events occur and what are the laws which control these events. Physics is a basic filed of science based on experimental observations and quantitative measurements about understanding natural events in the universe (Serway, 1996). According to Ertaş (1993), Physics is a science of nature which analyzes material energy and interaction of material. Physics which is the most common natural science deals with basic principles of the universe (Serway and Beichner, 2002).It is quite important that students learn the science of physics through comprehending and understanding. As the physics educators mentioned as a result of studies they carried out, it is seen that students would rather memorize formula to solve problems instead of learning and understanding the subject (Driver and Oldham, 1986). The main aim of science education is to teach and make comprehend science subjects, most of which are abstract. Choosing the most suitable methods in education process is an important step to reach the target. An effective learning is possible with learning through understanding and information learned being long-term. In physics education which includes abstract tennis, permanent learning would be enabled by making these terms concrete. The most beneficial environments for this aim are laboratories (Erkol, 2011).

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When we analyze literature, it is seen that there are various studies on contribution of laboratory practices on education (Şahin, 2001; Hofstein and Lunetta, 1982; Bates, 1978). There are also many studies which analyze psychomotor behaviours of students during laboratory activities and contributions of education in laboratory environment on physics knowledge of students (Beasley, 1985). In another study on this issue, it was stated that the most important problems encountered during process are that theoretical reasons are not parallel with laboratory practices, sufficient time is not allocated for practical lessons, instructor guidance is lacking (Aydoğdu, 1999).The essential aim of inquiry-based learning in physics laboratories is to strengthen mental development of students. In traditional thinking classes, students regard their teacher as experts who provide the correct answer. On the contrary, in inquiry-based education environment, students learn to construct their own perception and take responsibility to create their own information basis. The role of teacher in this process is to enable easiness which enhances learning of student (Collins, 1998). Direction towards this process in Physics education emerged together with reform studies in teacher raising program especially in America after 2000, it was based on raising instructors who both inquires and make students inquire (NRC, 2000). Inquiry-based learning is regarded as the most necessary component about problem development in many countries right now. Various studies put forward that inquiry in science education includes processes of providing opportunities for students to create questions in order to reach the information they would construct within learning process,

constructing research process, putting forward results and sharing data with others (Lin Tuan, 2005). Inquiry-based learning in Physics laboratories was exhibited through determination of situations of teachers and pre-service teachers in practice process and through studies on student success (Jing-Ruwang *et al*., 2010; Furtak and Alonzo, 2010). Apart from this, few studies deal with the self-sufficiency belief of both teachers and pre-service teachers about inquiry-based learning (Narayan and Lamp, 2010; Luera and Otto, 2005).

Telling the mistakes of terms known by students in classical teaching methods is not beneficial in eliminating alternative resources. Therefore in recent studies, methods which enable shifting from alternative terms of students with scientific ones was brought to the forefront (Köseoğlu *et al*., 2002; Maskan and Güler, 2004; Akgun *et al*., 2005; Özden, 2009; Aydın, 2010). For learning to be permanent and effective, minds of students should be kept active. For this, students should be thinking more. Prediction-Observation-Explanation (POE) method is a good alternative in this sense. For permanent and effective learning processes, methods based on constructivist approach should be known and applied well (Gürses, 2006). Such kind of methods should be determined not only in theory but also in laboratory practices. Thanks to POE method, students think more actively and their learning is permanent. POE method is based on student-centred and practical implementation of course. With this method, students' interest towards research in physics laboratories would increase and their success would increase as well, moreover this method is preferred because it is easy to apply (Tekin, 2008).POE method is one of the useful methods which enable students to use their mental skills actively in laboratory environment, and think more about processes in experiments and results they attained. When POE method is applied in physics education, students both gain the skills of predicting a scientific case and they had the chance to see whether their prediction is correct or not following their observation. In this way, their skills of scientific process would also increase (Köseoğlu *et al*., 2003; Karaer, 2007; Tekin, 2008; Yavuz and Çelik, 2013).

The main aim of inquiry-based which is another teaching method used in science education is to improve mental will of students. In an inquiry-based teaching environment, students learn to construct their understanding and take responsibility to form the basis of their own knowledge. The aim of inquiry-based learning is to search information from life and develop skills and attitudes that would generalize this information by using process of information gathering and problem solving skills (Duban, 2008). In this study "Guided Inquiry" method was used. This method includes teaching students to participate in learning process actively and reflecting the knowledge they have learned to daily life. Teacher is in the role of guide, resource and assistant. Guided Inquiry method enables students to improve terms specific to them. It helps to analyze subjects in details and ask their own questions. It enables students to inquire without exceeding the process of learning and make research (Martin *et al*., 1998; trn. Timur and Kıncal, 2010). Giving importance to critical thinking in the education of teacher would increase solving national and international problems of society. Critical thinking which is given credit in education of teacher follows these steps: (a) Critical thinking which is increased in education of teacher would indirectly influence and increase critical thinking in K-12 education, (b) critical thinking which is increase in K-12 education would cause use of critical thinking within society and (c) increase of critical thinking among leaders and citizens in a society emerges as problem solving better at social scale (Williams, 2005).

Scientific process sills which has an important place in science education and whose existence is determined with the studies (Acar, 2011; Duru *et al*., 2011; Yıldırım, 2012) should firstly be adopted by pre-service teachers, then it would be easier to convey students. Scientific process skills in science education form the basis of scientific studies and these skills which are not only specific to scientists would make all the individuals be scientifically literate, comprehend the nature of science and use in every corner of daily life (Harlen, 1999; trn: Aydoğdu, 2006).When the related literature is analyzed, Kibirige *et al*. (2014) studied with POE method on the use of Conceptual Change Model and analyzed how students overcome their misinformation about soluble salts. At the end of study, they concluded that POE is beneficial for discovering pre-knowledge of students and understand current process knowledge and this is beneficial for teachers to learn misinformation of students about science and overcome them. In their study, Duru *et al*. (2011) aimed to determine the effect of inquiry-based laboratory practice in Science and Technology Practices course on comprehending of science and technology, pre-service students' laboratory environment, their attitude towards laboratory and skill of using experimental processes. As a result of study, it was determined that there is a positive increase in process of students' use of scientific skills. In their study, Şahin and Usta-Gezer (2014) analyzed the effect of Inquiry-Based General Biology Laboratory practices on biology laboratory worries and critical thinking tendency of pre-service Science teachers. As a result of study, it was determined that there is an increase in critical thinking tendency of pre-service teachers with inquiry method, and expressed that traditional and reflective inquiry approaches enabled no change on biology laboratory worried of pre-service teachers.In the study which was carried out in order to enable development of scientific process skills and self-sufficiency of teachers about inquiry-based teaching through inquiry-based occupational development activities and to influence their belief positively, Kocagül (2013) determined that there is a significant development in teachers' scientific process skills. In the study which was carried out in order to determine the effects of inquiry-based learning method on conceptual understanding and scientific process skills of pre-service physics teachers for the issue of electrical conductivity, Yalçın (2014) found no significant difference between scientific process skills of experiment and control group. In the experimental study which was carried out with 21 pre-service teachers in order to determine critical thinking tendency of pre-service teachers, California Critical Thinking Tendency Scale was used as measurement instrument. As a result of the study, it was observed that pre-service teachers in experiment group show positive tendency in curiosity, analyticalness and self-sufficiency sub-dimensions and their critical thinking tendency is also high for the general sum.

Problem of Research

Problem sentence of the study what are the effects of Prediction-Observation-Explanation and inquiry based

teaching methods which were applied in General Physics Laboratory-1 on scientific process skills and critical thinking tendency of Science Teaching 1st class pre-service teachers.

MATERIALS AND METHODS

General Background of Research

The research model is experimental pattern pre and post-test without control group which is one of the quantitative research methods. Experimental pattern is the research model in which data to be analyzed are generated under direct control of researcher with the aim of determining reason-result relations (Karasar, 2009). Pre-tests and post-tests used in the study are California Critical Thinking Tendency Scale (CCTTS) and Scientific Process Skills Test (SPST). The research pattern is shown in Table 2-1.

Table 1. Research Pattern

Group	Pre-tests	Teaching Method	Post-tests
Group 1	CCTTS, SPST➔	Prediction-Observation-Explanation ➔	CCTTS, SPST
Group 2	CCTTS, SPST➔	Inquiry-Based	CCTTS, SPST

Sample of Research

The study group of this research is composed of Science Education Department students who receive General Physics Laboratory-1 course at a state university in north-west of Turkey. The study group is composed of 55 students. Experiment groups of the study are homogeneous. In this sense, group 1 who are taught their course with POE method are composed of 27 people and group 2 who are taught their course with Inquiry-based method are composed of 28 people.

Instrument and Procedures

Scientific Process Skills Test

The test which was developed by Burns *et al*. (1985) with 0.86 Cronbach alpha reliability value was adapted to Turkish by Özkan, Aşkar and Geban (1992). The aim in choosing the test is its applicability to university students and covering sub-dimensions which are needed to be analyzed. In this test which is composed of 36 multiple-choice questions, skills wanted to be measured are; defining variables (12 questions), operational definition (6 questions), forming hypothesis and making definition (9 questions), interpreting graphics and data (6 questions) and designing the research (3 questions).

California Critical Thinking Tendency Scale

The test which was developed by Facione, Facione and Giancarlo (1998) with 0.88 Cronbach alpha reliability value was adapted to Turkish by Kökdemir (2003). The scale was chosen since it is applicable to university students and covers sub-dimensions which are needed to be analyzed. Turkish adaptation of the scale is composed of 51 items and 6 sub-dimensions. These sub-dimensions are curiosity (9 questions), analyticalness (10 questions), open-mindedness (12 questions), self-confidence (7 questions), searching for the correct answer (7 questions) and systematicity (6 questions).

Implementation of the Course

In the application of POE teaching method, for the prediction stage, students were expected to answer questions in activity worksheets which were prepared and handed out to students by the researcher about the experiment in collaborative groups and write them down for the sections allocated for them in activity worksheets. For the observation stage, again according to the steps in activity worksheets, students were enabled to carry out experiment in a way that they would interact with their group friends. They were again expected to write their observations in the sections allocated for them. For the explanation stage, students were first expected to evaluate themselves, confirm their predictions through observations or correct their contradiction if they have and write down in activity worksheets. Then all the class come together and students share their observations and ideas and a common idea was attained. Students were again expected to write new terms they have acquired from exchange of ideas in activity worksheets and the activity was completed. In the application of Inquiry-Based Teaching method, activity worksheets prepared by the researcher was handed out to the students. Following Hofstein (2005) inquiry steps, first of all pre-inquiry was done with the help of stories in activities. Then, students were enabled to generate research problems based on this story. Hypotheses were developed which were suitable to solve research problems created by students. Hypotheses developed were conducted experimentally; data were collected and transferred to activity worksheets as table and graphics. After all these stages evaluation section was filled in and the course was completed.

Data Analysis

The analysis of data which were collected in the research was made with the help of SPSS.18 package program in computer environment. Since the sample size of group is less than 30 people, non-parametrical tests were preferred. Wilcoxon Test was used in pre-test and post-test comparison of the same experiment groups, Mann-Whitney U Test was used in pre-test and post-test comparison of different experiment groups.

RESULTS

It was analyzed through Wilcoxon Test that whether POE method applied in General Physics Laboratory-1 course on pre-service teachers who receive education in Science Education Department has a significant difference in pretest-posttest results of and it was observed that there was no statistically significant difference (Table 3-1). As it is seen in Table 3-1; among scientific process skills total scores and sub-factors of pre-service teachers in Inquiry-based Teaching method which is applied in General Physics Laboratory-1 course on Science Education Department pre-service teachers; there was statistically significant difference at 05 level on behalf of posttest between pretest-posttest results in defining variables and operational definition sub-factors. It was analyzed through Mann Whitney-U Test that whether POE and Inquiry-based methods applied in General Physics Laboratory-1 course on pre-service teachers who receive education in Science Education Department has a significant difference between posttest results of scientific process skills and sub-factors of pre-service teachers and there was no statistically significant difference (Table 3-2).

Table 3-1. Results of Wilcoxon Test carried out for Pretest-Posttest Scores of Scientific Process Skills and Sub-dimensions of Pre-service Teachers in Group 2

Scientific Process Sub-factor	Pretest-Posttest	n	Rank Average	Rank Total	Z	P
Defining Variables	Negative Rank	5	10,70	53,50	-3,281	0,001*
	Positive Rank	22	14,75	324,50		
	Equal	1				
Operational Definition	Negative Rank	6	5,00	30,00	-2,251	0,024*
	Positive Rank	11	11,18	123,00		
	Equal	11				
Forming Hypothesis and Making Definition	Negative Rank	10	11,60	116,00	-0,983	0,326
	Positive Rank	14	13,14	184,00		
	Equal	4				
Interpreting Graphics and Data	Negative Rank	9	11,00	99,00	-0,234	0,815
	Positive Rank	11	10,09	111,00		
	Equal	8				
Designing the Research	Negative Rank	9	8,00	72,00	-0,229	0,819
	Positive Rank	7	9,14	64,00		
	Equal	12				
Total	Negative Rank	6	11,83	71,00	-2,846	0,004*
	Positive Rank	21	14,62	307,00		
	Equal	1				

$p < .05$

Table 3-2. Results of Wilcoxon Test carried out for California Critical Thinking Tendency Scale and Sub-dimensions of Pre-service Teachers in Group 1

Critical Thinking Sub-factor	Pretest-Posttest	n	Rank Average	Rank Total	z	p
Curiosity	Negative Rank	4	13,63	54,50	-3.081	0.002*
	Positive Rank	22	13,48	296,50		
	Equal	1				
Analyticalness	Negative Rank	13	9,38	122,00	-0.146	0.884
	Positive Rank	9	14,56	131,00		
	Equal	5				
Open-mindedness	Negative Rank	9	10,89	98,00	-1.489	0.136
	Positive Rank	15	13,47	202,00		
	Equal	3				
Self-confidence	Negative Rank	9	10,61	95,50	-1.566	0.117
	Positive Rank	15	13,63	204,50		
	Equal	3				
Searching for correct answer	Negative Rank	16	10,56	169,00	-0.166	0.868
	Positive Rank	10	18,20	182,00		
	Equal	1				
Systematicity	Negative Rank	6	11,42	68,50	-2.135	0.330
	Positive Rank	17	12,21	207,50		
	Equal	4				
Total	Negative Rank	7	13,00	91,00	-2.148	0.320
	Positive Rank	19	13,68	260,00		
	Equal	1				

$p < .05$

Table 3-2. Results of Wilcoxon Test carried out for California Critical Thinking Tendency Scale and Sub-dimensions of Pre-service Teachers in Group 1

Critical Thinking Sub-factor	Pretest-Posttest	n	Rank Average	Rank Total	z	p
Curiosity	Negative Rank	4	13,63	54,50	-3.081	0.002*
	Positive Rank	22	13,48	296,50		
	Equal	1				
Analyticalness	Negative Rank	13	9,38	122,00	-0.146	0.884
	Positive Rank	9	14,56	131,00		
	Equal	5				
Open-mindedness	Negative Rank	9	10,89	98,00	-1.489	0.136
	Positive Rank	15	13,47	202,00		
	Equal	3				
Self-confidence	Negative Rank	9	10,61	95,50	-1.566	0.117
	Positive Rank	15	13,63	204,50		
	Equal	3				
Searching for correct answer	Negative Rank	16	10,56	169,00	-0.166	0.868
	Positive Rank	10	18,20	182,00		
	Equal	1				
Systematicity	Negative Rank	6	11,42	68,50	-2.135	0.330
	Positive Rank	17	12,21	207,50		
	Equal	4				
Total	Negative Rank	7	13,00	91,00	-2.148	0.320
	Positive Rank	19	13,68	260,00		
	Equal	1				

$p < .05$

As it is seen in Table 3-2; POE method which is applied in General Physics Laboratory-1 course on Science Education Department pre-service teachers; there was statistically significant difference at 05 level on behalf of posttest between pretest-posttest results of pres-service teachers' critical thinking tendencies curiosity sub-factor, there was no significant difference in other sub-factors and total score type. Results of Wilcoxon Test carried out for Pretest-Posttest Scores of California Critical Thinking Tendency Scale and Sub-dimensions of Pre-service Teachers in group 2 were presented in Table 3-3.

Table 3.3. Results of Wilcoxon Test carried out for Pretest-Posttest Scores of California Critical Thinking Tendency Scale and Sub-dimensions of Pre-service Teachers in Group 2

Critical Thinking Sub-factor	Pretest-Posttest	n	Rank Average	Rank Total	z	p
Curiosity	Negative Rank	5	6,10	30,50	-3,423	0,001*
	Positive Rank	19	14,18	269,50		
	Equal	4				
Analyticalness	Negative Rank	14	12,50	175,00	-0,640	0,522
	Positive Rank	14	16,50	231,00		
	Equal	0				
Open-mindedness	Negative Rank	9	14,28	128,50	-1,700	0,089
	Positive Rank	19	14,61	277,50		
	Equal	0				
Self-confidence	Negative Rank	15	14,30	214,50	-0,615	0,538
	Positive Rank	12	13,63	163,50		
	Equal	1				
Searching for correct answer	Negative Rank	16	10,81	173,00	-0,659	0,510
	Positive Rank	8	15,88	127,00		
	Equal	4				
Systematicity	Negative Rank	13	12,08	157,00	-0,148	0,882
	Positive Rank	12	14,00	168,00		
	Equal	3				
Total	Negative Rank	11	12,68	139,50	-1,190	0,234
	Positive Rank	16	14,91	238,50		
	Equal	1				

$p < .05$

As it is seen in Table 3-3; Inquiry-based method which is applied in General Physics Laboratory-1 course on Science Education Department pre-service teachers; there was statistically significant difference at 05 level on behalf of posttest between pretest-posttest results of pres-service teachers' critical thinking tendencies curiosity sub-factor, there was no significant difference in other sub-factors and total score type. It was analyzed through Man Whitney-U Test that whether POE and Inquiry-based methods applied in General Physics Laboratory-1 course on pre-service teachers who receive education in Science Education Department has a significant difference between posttest results of critical thinking tendencies and sub-factors of pre-service teachers and there was no statistically significant difference.

DISCUSSION

Although it was put forward by many studies that inquiry-based learning method improves scientific process skills (Tatar, 2006; Başdaş, 2007; Bayrak, 2007; Güngör-Seyhan, 2008; Köksal, 2008; Anagün and Yaşar, 2009; Karakuyu *et al*., 2013), in many of the studies traditional teaching method was taken into account for comparison. Moreover in literature, it was emphasized that sub-dimensions develop more difficultly in studies which analyze sub-dimensions of scientific process skills (Padilla *et al*., 1984; Ostlund, 1992; Griffiths and Thompson, 1993; German 1996; Turpin and Cage, 2004; Çakar, 2008; Sinan and Uşak, 2011). Tatar, 2006; Başdaş, 2007; Bayrak, 2007; Güngör-Seyhan, 2008; Köksal, 2008; Anagün and Yaşar, 2009; Karakuyu *et al*., 2013). As a result of the study, there was a significant difference between pretest-posttest scores of Inquiry-based learning method on defining variables and operational definition which are sub-dimensions of scientific process skills. In the study carried out with Inquiry-based laboratory activities within the scope of Elementary Grade 7 Science and Technology course, Ulu (2011) found a significant difference at all sub-factors of Scientific Process Skills Test.

Different from this study, the reason why other sub-factors show significant difference can be stated as the different course contexts and level difference of study groups. In Inquiry-based laboratory practice carried out with undergraduate biotechnology students, the effectiveness of students in using conceptual learning, critical thinking and scientific process skills was put forward (Ketpichainarong *et al*., 2010). Inquiry-based learning activities improve inquiry skills and scientific process skills of students (Cuevas *et al*., 2005). In their study, Duru *et al*., (2011) determined forming problem, determining hypothesis variables after inquiry-based laboratory practice and expressed that their skill of designing experiment improved considerably. Akben (2011) stated that laboratory activities based on scientific inquiry developed by pre-service classroom teacher in Science and Technology Laboratory Practice I and II are effective in developing scientific process skills of preservice teachers. When the literature is analyzed, it is seen that there are other studies which support this result (Budak, 2008; Kanlı, 2007; Mc Cain, 2005; Roth and Roychoudhury, 1993). Dana (2001) found that inquiry-based laboratory activities at different levels are effective in developing use of scientific process skills. Başağa *et al*. (1994) found statistically significant difference between pretest-posttest of scientific process skills of students who receive education at Science Teaching Department 2nd class within the scope of biochemistry course with inquiry-based laboratory activities. In his study carried out within the scope of 8th class Science and Technology course with inquiry-based laboratory activities,

Yıldırım (2012) stated that there was not a significant difference in Scientific Process Skills of students however Anagün and Yaşar (2009), Başdaş (2007), Bayrak (2007), Köksal (2008), Seyhan (2008), Tatar (2006) stated that there were significant differences. In his study carried out for pre-service Physics teachers, Arslan (2013) determined that research-inquiry method caused significant differences in pre-tests in graphic and functional definition questions. In his study Aydoğdu (2012) analyzed skills of forming hypothesis, determining and controlling variables of pre-service science teachers and determined that these skills were low. He stated that the reason was definitions of dependent-independent variables were not explained to pre-service students clearly and caused confusions among pre-service teachers. In the study carried out in this sense, these terms were explained to pre-service teachers more clearly and they were enabled to understand the terms precisely. As a result of this there was a positive significant difference in sub-factor of defining variables of scientific process skills. The reason why curiosity sub-factor of Critical Thinking Tendency Scale of pre-service teachers who were applied with POE method is statistically significant is thought to be due to the process of arousing curiosity at Prediction stage of POE method. When the literature is analyzed, there was no study in which POE method was used and which analyze Critical Thinking Tendency of pre-service teachers.

Conclusions

In this study, it was determined that Inquiry-Based Learning had a significant difference between pretest-posttest scores on curiosity which is one of the sub-factors of Critical Thinking Tendencies and there was no significant difference on other sub-factors and on total score type. Pre-service teachers do inquire they are expected to do in the activities and use their curiosity level intensively which is thought to be the most important factor of this result. In his study which was carried out in order to determine the effect of self-evaluation activities applied in General Physics Laboratory-1 course on critical thinking tendencies of pre-service science teachers, Çorapcıgil (2014) determined decrease in critical thinking tendency of control and no statistical difference in experiment group. He determined that there is statistically significant decrease in understanding the correct answer, open-mindedness and analyticalness sub-dimensions of CCSS, and significant increase in sub-dimension of self-confidence. When the study group was analyzed, it was stated that there was a statistically significant difference only in self-confidence sub-dimension and in other sub-dimensions there was no significant change. The result of this study which was carried out with a different teaching method in Physics laboratories is not similar with the result of this study. The reason of this is thought to be that the teaching method applied has much more effect on critical thinking rather than the course context. In his study carried out within the scope of Undergraduate Level General Biology-2 Laboratory course, Şahin (2014) determined that inquiry-based general biology laboratory activities has positive effect on critical thinking tendencies of pre-service teachers. It is seen in the literature that Inquiry-based Teaching Method improves critical thinking among students in different educational levels (Mecit, 2006; Casotti *et al*., 2007; Duban, 2008; Tessier, 2010). It was stated in the study of Casotti, Rieser-Danner and Knabb (2007) that inquiry based learning which is used in various laboratory courses improves critical thinking of students. In their studies, Friedel *et al*. (2008) stated that inquiry-based teaching environment created significant increase in critical thinking tendency. When the average values are analyzed, it is seen that critical thinking posttest score of students were higher than their pretest score. This situation shows that Inquiry-Based Learning method which is applied within the scope of General Physics Laboratory-1 course contributes to the development of critical thinking tendency of pre-service teachers. In the environment of Inquiry-Based Learning method which enables students be active, it is an expected result that students' being directed to inquiry and have lessons in collaborative working environment influence their critical thinking more positively. In this sense, it is seen that the study is partly parallel with the studies in the literature. The reasons for points which are not parallel can be that Physics Laboratory practices and experiments include more intensive mathematical operations compared to other science courses and science laboratory practices.

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