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The Effect of Using Social Networks in The Inquiry-Based General Chemistry Laboratory Course

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Abstract

The aim of this research is to examine the effect of social network environment supported use of inquiry-based activities developed for the general chemistry laboratory course. Throughout the research, Attitude Towards General Chemistry Laboratory Scale and Science Process Skills Perception Scale were used as quantitative data gathering means and applied to students before and after the implementation. Eighty-three pre-service science teachers participated in this study. Study group was chosen from first graders who take "General Chemistry Laboratory" course with criterion sampling method that is one of the purposive sampling methods. Laboratory activities which were developed in terms of Science Process Skills (SPS) were used for Experimental Group 1 and these activities were also supported by social network and were applied for group Experimental Group 2, for group Control Group the Laboratory activities in curriculum textbooks that are weak in terms of SPS were applied. The effects on students' attitudes towards general chemistry lab and their perception of SPS were studied for all three groups. As a result of the research, it has been determined that the inquiry-based learning approach positively affects the Science Teaching students' perceptions of SPS but has no positive or negative effect on their attitudes towards the general chemistry laboratory. Moreover, it turned out that social network support positively contributed to students' attitudes towards the laboratory. When designing and implementing the activities included in the Science Education curriculum, it is important to consider all valuable teaching technologies, including internet and social networking sites. In case of an effective injury from these, efficiency in education and training can also increase positively.

Keywords: Inquiry; Laboratory; Social Networking; Science Process Skills

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INTRODUCTION

In a world full of technological products developed in the light of scientific research, it has become a necessity for everyone to be scientific literate in terms of understanding and using technology. Everyone should be smartly engaged in public discourse and debates on important issues involving science and technology. Everyone should share their experiences and develop individually in order to learn all about nature (Zhong and Xu, 2019). In science lessons, students encounter many concepts and phenomena and begin to get to know themselves, nature and the world. Adapting the information in science lessons to daily life is important for students to learn meaningfully. It is necessary to develop scientific thinking, inquiry, research and problem-solving skills in order to enable students to learn information meaningfully (Lim, 2001).

Science education program in Turkey is based on constructivist approach. Constructivist approach aims to raise individuals who can discover, question, are willing to learn, understand, use and develop new technologies, can self-manage, make decisions and take the responsibility of their decisions, and have advanced problem-solving skills. In other words, today, the events that occur in our society together with the world are affected by scientific activities (MoNE, 2018). It is necessary to analyze the reflections of these scientific activities on our social life. Furthermore, raising critical and questioning individuals is an important element as stated in the aims of Ministry of National Education (MoNE). Based on the stated objectives of the science curriculum, it is important to implement inquiry-based learning in schools (MoNE, 2018).

Inquiry-based learning is a learning approach based on constructivist theory, that focuses on the research process rather than creating products or problem solving, and develops high-level thinking and research skills. Inquiry-Based Learning transforms the learning process into a form where the student is an active participant and structures his learning by doing research with activities (Lim, 2001). Inquiry-Based Learning is a way of asking questions, researching and accessing information, finding something new about a phenomenon. In other words, in Inquiry Based Learning, which is defined as science operations, the student learns science by combining scientific knowledge and processes by using cause-effect relationship and critical thinking. Inquiry-Based Learning enables students to learn science concepts, to evaluate "what do we know and how do we know?", to understand the nature of science, to gain the skills required to become independent researchers in the natural world, and to develop their attitudes, skills and abilities related to science (NSES, 1996). There are four forms of application of the inquiry-based teaching approach in the classroom environment: confirmation inquiry, structured inquiry, guided inquiry, and open inquiry (Banchi and Bell, 2008). Through confirmation inquiry, students confirm a principle through an activity when the results are known in advance. In structured inquiry approach, all stages of the teaching are determined by the teacher and the students follow these stages and reach the result by being guided by the teacher. In the guided inquiry approach, the students shape the teaching themselves and the teacher guides this process. In open inquiry approach, students determine the teaching process, the teacher does not participate in the process, watches from outside or gives little guidance in departments where students have difficulty (Çelik, Şenocak, Bayrakçeken, Taşkesenligil, and Doymuş, 2005).

Inquiry-based learning is a thinking process. Teachers should demonstrate model behaviors that show students how to think and use inquiry research. Inquiry-based learning includes educational activities in which students participate individually or in groups. In this type of learning approach, the student takes part in the whole process of inquiry and learns in this process (Gilardi and Lozza, 2009). While students are questioning, they learn more about the subject and learn to learn (Shih, Chuang and Huang, 2010). The aim of inquiry-based science education is to help students develop their inquiry, research and process skills (Duban, 2008).

Studies in the literature show that inquiry-based teaching activities are more effective than traditional teaching activities on variables such as achievement, attitude, and scientific process skills (Colburn, 2006; Çalışkan, 2008; Dilbaz, Yelken, and Özgelen, 2016; Geier et al. 2008; Gibson and Chase, 2002; Karapınar, 2016; Şensoy and Yıldırım, 2017; Wilson, Taylor, Kowalski, and Carlson, 2010). However, these studies are mostly on the theoretical basis and ignore social and interactive way of teaching and learning. Suzić, Dabić, and Ćirković Miladinović (2013) implies that, high level of communicative competence is something that is essential to students for their development, and can be achieved through well-organized classes with an emphasis on interactive communication. The term "educational communication" here needs to be defined. Unlike the standard definition of education which states that it is the process by which people exchange information or express their thoughts and feelings, definition of educational communication is more complex, because in addition to the standard communication criteria (number of participants, means of communication, and content of communication) educational communication incorporates an incomplete ability of one person to communicate with the other (communication between a student and a teacher or other source of information). Therefore, it is said that the main goal of educational communication is to help students develop skills for a complete and independent communication with people and media of communication (Suzić, 2005). With the constructivist approach, education is no more a one directional information flow. Rather it is a process of communication between student and teacher as well as student and student.

Today, we can clearly see that the way we communicate and the way we interact greatly differs for 20 years back. The introduction of social networks to our lives reshapes how we communicate with others and also how we express ourselves. Moreover, we observe this communicational shift more intensely on the young population whom we may consider as the audience of the education process.

Social network websites are websites that enable individuals to identify themselves on the internet in the community life, to communicate with people with whom they can easily get along at the same cultural level, by internet communication methods, and to establish social communication by showing symbolic movements that symbolize various gestures in social life. Today, many social networking websites have emerged and these sites are reshaping the way people communicate, interact, collaborate, work together and even learn. Today, millions of users are online on social networks with their real identities. Social networks have features that improve students 'and teachers' communication skills, expand participation, strengthen peer support, and enable collaborative learning (Wang et al., 2020). It is easy for students and teachers to create an educational community by following simple steps through social networks, share among themselves, communicate and receive feedback. Social network sites also provide opportunities such as supporting the learning process of students and supporting the teaching and evaluation process of the teacher by enriching the learning and teaching processes with materials such as text, video, and audio (Pallora and Zhu, 2011).

Within the literature there are numerous researches about social network supported educational environments mostly about information and communication technology education (Karabulut, 2017; Öztürk and Tetik, 2015; Tınmaz, 2011) and partly about language education (Çimen, 2015; Fuquene, 2020). The studies about social network support in science education and especially in laboratory setting are highly limited (Whittaker, Howarth and Lymn, 2014; Pai et. Al, 2017). From this point of view, we yield great importance to this study as it stands as a rare example of this practice.

The aim of this research is to examine the effects of social network-supported, inquiry-based and SPS-enriched activities on students' attitudes towards General Chemistry Laboratory Course and their perceptions of SPS.

METHOD

In this study, quasi-experimental design was used. The pattern stands out by taking the measurements of the dependent variable of the groups before application. There is no random assignment in the pattern and therefore, it can be said that the pattern is open to many threats in terms of internal and external validity (Büyüköztürk, 2016). Knowing the starting point of the groups regarding the measured quality, so that the change that can occur can be measured and tested, increases the usability of the pattern. The pattern can be defined as an experimental design without random assignment because it contains process conditions and repeated measurements (Fraenkel & Wallen, 2006).

Participants

Study group of the research were determined to be 83 students of the Science Teaching program of the Faculty of Education. participants were chosen from first graders who take "General Chemistry Laboratory" course with criterion sampling method that is one of the purposive sampling methods. In this method, participants are composed of individuals, events, objects or situations with the qualifications identified in relation to the problem (Büyüköztürk, Akgün, Karadeniz, Çakmak, and Demirel, 2013). Students with Internet access and actively using social networks are particularly preferred for the Experimental Group 2 (EG2). No criteria were used to select Experimental Group 1 (EG1) and Control Group (CG) students. Laboratory activities which were developed in terms of SPS were used for EG1 and these activities were also supported by social network and were applied for group EG2, for group CG the Laboratory activities in curriculum textbooks were applied. The total of 27 students with Internet access and actively using social networks were chosen for the EG2. Initially both CG and EG1 groups consisted of 29 students each but two students withdraw in the process and finally EG1 group shaped as 27 students.

Data Collection Tools

Attitude Towards General Chemistry Laboratory Scale (ATGCLS)

ATGCLS was used to observe the pre-service teachers' attitudes towards the General Chemistry Laboratory before and after the application. This 5-point likert-type attitude scale was developed by Kaya (2012), which contains 22 positive and 13 negative items with Cronbach alpha reliability coefficient as .844. 13 items that were negative were evaluated by reversing. In this respect, the lowest score that can be obtained from the scale, which contains a total of 35 items, is 35 while the highest score is 175. One-way ANOVA was used to compare the mean scores of the students before and after the treatment.

Science Process Skills (SPS) Perception Scale

SPS Perception Scale was used to observe the pre-service teachers' perceptions about their SPS. Namely, we wanted to see how the students feel about their competency on SPS throughout the study. In this study SPS was considered under two sub headings as Basic Process Skills and Integrated Process Skills (Table 1) in line with the approach of Ongowo and Indoshi (2013).

Table 1. Science Process Skills

Basic Process Skills	**Description**
Observing	Use of five senses to derive data
Classifying	Sorting, grouping and arranging based similarities and differences
Measuring	Using standard and non-standard measures to describe dimensions
Predicting	Stating the outcome of a future event based on a pattern of evidence
Inferring	Explanation of observations and data
Communicating	Using words or symbols to describe an action, object or event
Integrated Process Skills	**Description**
Formulating Hypothesis	Stating the expected outcome of an experiment
Controlling Variables	Identifying variables, keeping variables constant and manipulating
Interpreting Data	Organizing, concluding from data and making sense of data
Defining Operationally	Stating how to measure a variable in an experiment
Experimenting	Testing by following procedures to produce verifiable results
Formulating Models	Creating a mental or physical model of a process or event

The 5-point likert-type perception scale, developed by the researcher, contains 18 items, was conducted on 146 people and the Cronbach alpha reliability coefficient was found to be .76 for all dimensions of the scale. The lowest score that can be obtained from the scale, which contains a total of 18 items, is 18 while the highest score is 90. One-way ANOVA was used to compare the mean scores of the students before and after the treatment.

Research Procedure

In this study, within the scope of General Chemistry Laboratory II course, an experimental guide, which has already been using for years and seemingly insufficient in terms of achievements related to SPS and designed at a level that can attain maximum 6 SPS (Table 2), was used for the CG group.

Table 2. Addressed SPS in the Control Group Laboratory Guide

Experiment Number	Science Process Skills												Total Addressed SPS Count
	Basic Process Skills						Integrated (Experimental) Process Skills						
	Observing	Classifying	Measuring	Predicting	Inferring	Communicating	Formulating Hypothesis	Controlling Variables	Interpreting Data	Defining Operationally	Experimenting	Formulating Models	
1	+	-	+	-	-	-	-	-	+	-	+	-	4
2	+	-	+	-	-	-	-	-	+	-	+	-	4
3	+	-	+	-	-	-	-	-	+	-	+	-	4
4	+	-	+	-	-	-	-	-	+	-	+	-	4
5	+	-	+	-	-	-	-	-	+	-	+	-	4
6	+	-	+	-	-	-	-	-	+	-	+	-	4
7	+	-	+	-	-	-	-	-	+	+	+	-	4
8	+	-	+	-	-	-	-	-	+	-	+	-	4
9	+	-	+	-	-	-	-	-	+	-	+	-	4
10	+	-	+	-	-	-	-	-	+	+	+	+	6

For groups EG1 and EG2, SPS enriched 10 activities were re-designed with the aim of providing at least 9 SPS (Table 3), instructions for students on how to implement these activities, and instructions containing various laboratory safety warnings were used.

Table 3. Addressed SPS in the EG1-EG2 Group Laboratory Guide

Experiment Number	Science Process Skills												Total Addressed SPS Count
	Basic Process Skills						Integrated (Experimental) Process Skills						
	Observing	Classifying	Measuring	Predicting	Inferring	Communicating	Formulating Hypothesis	Controlling Variables	Interpreting Data	Defining Operationally	Experimenting	Formulating Models	
1	+	+	+	+	+	+	+	+	+	-	+	-	10
2	+	-	+	+	+	+	+	+	+	-	+	-	9
3	+	+	+	+	+	+	+	+	+	-	+	-	10
4	+	-	+	+	+	+	+	+	+	-	+	-	9
5	+	-	+	+	+	+	+	+	+	-	+	-	9
6	+	-	+	+	+	+	+	+	+	-	+	-	9
7	+	-	+	+	+	+	+	+	+	-	+	-	9
8	+	-	+	+	+	+	+	+	+	-	+	-	9
9	+	-	+	+	+	+	+	+	+	-	+	-	9
10	+	+	+	+	+	+	+	+	+	+	+	+	12

The names of the experiments conducted in this study carried out for ten weeks are as follows:

Experiment 1: Preparation of Solutions with Specific Concentration Values.

Experiment 2: Solubility Event and Effect of Temperature on Solubility.

Experiment 3: Concept of pH and Acid-Base Indicators.

Experiment 4: Freezing Point Depression (Cryoscopy)

Experiment 5: Chemical Equilibrium.

Experiment 6: Chemical Kinetics: Effect of Concentration on Reaction Rate.

Experiment 7: Chemical Kinetics: Effect of Temperature on Reaction Rate.

Experiment 8: Material Separation from Solution with The Help of Electric Current.

Experiment 9: Reaction Heat.

Experiment 10: Chemical Bonds and Molecule Models.

In the activity guide developed, students are oriented by the guiding sentences that can actively apply scientific processes and gain these skills, and these sentences are expressed with more emphasis (like bold writing). For example; **"... ... observe the event", "... based on your assumptions about solutions and solubility event", "establish based on the hypotheses given below based on the variables that can affect the solubility of the substance", "make predictions based on your daily life experiences and may affect the solubility of the substance write down your estimates about the variables and discuss them with your group members", "… record the data, show them on the chart and draw the temperature-resolution chart ", "… interpret the results ", "… classify the water-soluble and insoluble substances"** and so on. It can be stated that such an approach may result in great contributions in the implementation of student-centered strategies in science teaching.

A newer "Experiment Report Format" was also proposed to experimental group students to report their observations and results about the experiments related to the activities implemented for 10 weeks. Students were encouraged to record and report their hypotheses, their observations on implementation, their results, and their answers to evaluation questions through this report format. In the below table a brief summary of the research process was tabulated (Table 4).

Table 4. Addressed SPS in the EG1-EG2 Group Laboratory Guide

Group	Pre-test	Implementation Process (10 weeks)				Post -test
		Report Format	Before Experiment	During Experiment	After Experiment	
CG	ATGCL and SPSPC Applied	Standard Report Format Used	No Applications	Standard Activities Carried Out	No Applications	ATGCL and SPSPC Applied
EG1	ATGCL and SPSPC Applied	An Inquiry Based Report Format Used	No Applications	Inquiry Based Activities Carried Out	No Applications	ATGCL and SPSPC Applied
EG2	ATGCL and SPSPC Applied	An Inquiry Based Report Format Used	Question-Answer Contest Over Facebook	Inquiry Based Activities Carried Out	Medias Shared in Facebook Group	ATGCL and SPSPC Applied
				Medias (Video, Picture) Taken to be Shared on Social Network	Experiment Results Discussed in Facebook Group	

The EG2 is an experimental group where inquiry-based and social networking supported experimental activities are performed. Experimental activities in the EG2 were developed by enriching the experimental activities used in the CG based on inquiry-based learning approach and SPS and supporting these activities using social networks.

Experimental activities prepared within the framework of the steps of initiating inquiry, focusing on research and sharing understanding for the EG1 were supported with social networking opportunities for the EG2 group. A Facebook group was established for the EG2 students under the name of "K.Ü. Deney Grubu" and all students participated in this group (Figure 1).

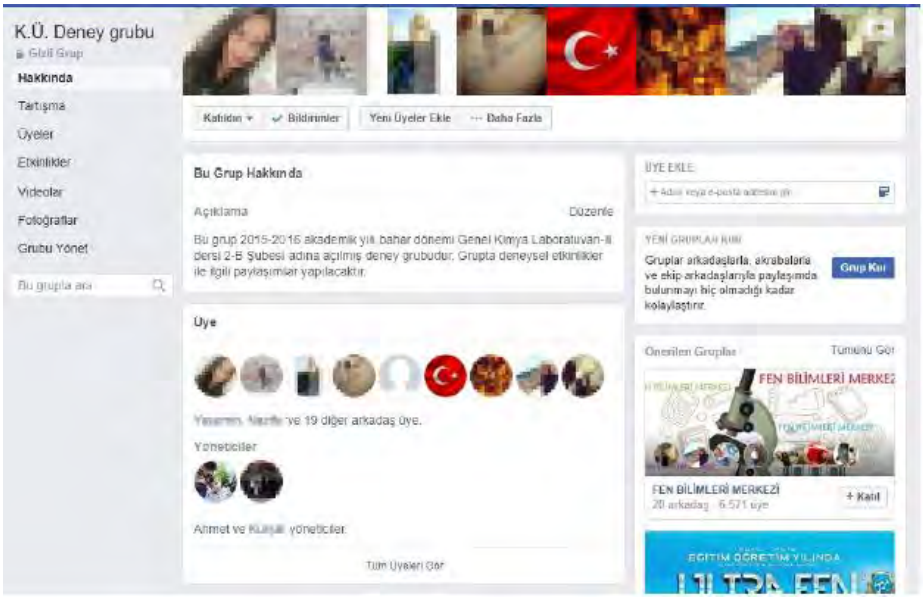

Figure 1. EG2 Facebook Group Page

The initialization step starts for the EG2 before coming to the laboratory via the social network. The students were asked a question about the experimental activity to be held at the same time, each week on the same day, to prepare themselves for the activity, to trigger their curiosity, to reveal their current knowledge and to relate the experiment to daily life. 24 hours were given to answer the question; accurate and quick answers were encouraged by a scoring system (Figure 2).

Figure 2. Question-Answer Contest in Facebook Group

The answers sent by the students through private messages are as important as the initiation step of questioning, encouraging them to prepare before the application, determining their misconceptions and knowing the current knowledge levels in advance (Figure 3).

Figure 3. Student Responses to Question-Answer Contest

The activity can be reviewed and changed from these messages. It was thought that the experimental activity might be more efficient, if the students could perform a research on the subject before the activity in the laboratory.

During the experimental activity, students are asked to take photos and/or videos of the experimental stages and share them in the related section of the social network group. The student's sharing of the images and videos recorded while participating in the experiment and also discussing about the experiment in the social networking group ensures that they stay in the experimental activity in different learning environments even after they leave the laboratory (Figure 4).

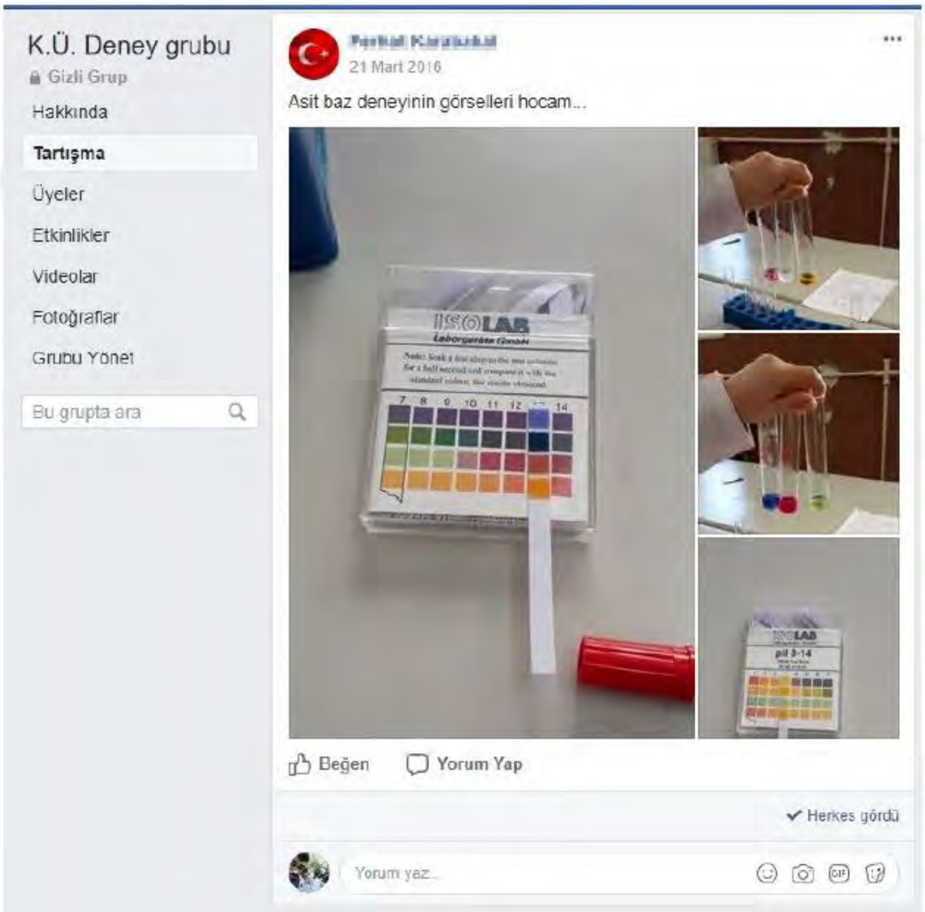

Figure 4. Images of Experiments Shared by Student in Facebook Group

RESULTS

In this section, we presented the Pre-test and Post-test scores of the data collection tools. Moreover, some statistical analysis was given about the mean difference significance parameters. ATGCLS Pre-test Scores are presented in the Table 5.

Table 5. ATGCLS Pre-test Scores

	Group	N		S
ATGCLS Pre-test Scores	CG	29	65.19	11.14
	EG1	27	65.10	15.39
	EG2	27	63.36	12.71
	Total	83		

As a result of the pre-test, the average CG pre-test was found to be 65.19, the average EG1 was 65.10 and the EG2 was 63.36. In order to see if any of these values differ from one another significantly, variance analyze was applied. ATGCLS Pre-test ANOVA Results are shown in Table 6.

Table 6. ATGCLS Pre-test ANOVA Results

Source of Variation	SS	DoF	MS	F	p-value
Between Groups	58.45	2	29.22	.17	.85
Within Groups	13835.80	80	172.95		
Total	13894.25	82			

As seen on Table 6 one-way analysis of variance on means revealed that the group averages did not differ significantly (p =.845>.05). After the implementation, the same scale applied as the post-test. ATGCLS Post-test Scores are shown below in Table 7.

Table 7. ATGCLS Post-test Scores

	Group	N		S
ATGCLS Post-test Scores	CG	29	65.66	12.08
	EG1	27	73.70	15.09
	EG2	27	76.70	12.90
	Total	83		

After the implementation, the ATGCLS CG group average score was 65.66, while the mean EG1 group was 73.70 and the EG2 group was 76.70. ATGCLS Post-test ANOVA Results were presented in Table 8.

Table 8. ATGCLS Post-test ANOVA Results

Source of Variation	SS	DoF	MS	F	p-value
Between Groups	1841.73	2	920.87	3.80	.027
Within Groups	19399.81	80	242.50		
Total	21241.54	82			

One-way analysis of variance on posttest mean scores in Table 8 showed a statistically significant difference between mean scores (p =.027 <.05). In order to identify the sources of this significant mean difference Scheffé Test was applied. Results are shown on Table 9.

Table 9. General Chemistry Laboratory Attitude Scale Post-test Scheffé Test Results

Groups		Mean Difference	Std. Error	Sig.
CG	EG1	-8.05	4.11	.161
	EG2	-11.05	4.16	.034*
EG1	CG	8.05	4.11	.161
	EG2	-3	4.24	.779
EG2	CG	11.05	4.16	.034*
	EG1	3	4.24	.779

Scheffé Test Results revealed that there is a significant difference between groups CG and EG2 and in favor of EG2 (Table 9). Accordingly, inquiry based, and social network supported activities positively affected students' attitudes towards General Chemistry Laboratory.

SPS Perception Scale was applied to the CG and EG's before and after the experimental application in order to determine the perception levels of science teaching students towards SPS. SPS Perception Scale Pre-test Scores are tabulated as Table 10.

Table 10. SPS Perception Scale Pre-test Scores

	Group	N		S
SPS Perception Scale Pre-test Scores	CG	29	61.21	4.87
	EG1	27	60.85	7.21
	EG2	27	63.33	6.87
	Total	83		

As a result of the pre-test, the CG pre-test average was 61.21, the average EG1 group was 60.85 and the EG2 group was 63.33. In Table 11 variance analyze can be seen to check if any of the mean scores differ significantly.

Table 11. SPS Perception Scale Pre-test ANOVA Results

Source of Variation	SS	DoF	MS	F	p-value
Between Groups	97.93	2	48.97	1.21	.304
Within Groups	3240.17	80	40.50		
Total	3338.10	82			

As seen on Table 11 one-way analysis of variance on the means revealed that the group averages did not differ significantly (p =.304>.05), considering that the students did not do any study based on SPS prior to the application. Therefore, this result can be considered a consistent result. After the experimental process, SPS Perception Scale was applied again as a post-test (Table 12).

Table 12. SPS Perception Scale Post-test Scores

	Group	N		S
SPS Perception Scale Post-test Scores	CG	29	61.59	5.42
	EG1	27	68.30	7.02
	EG2	27	69.04	7.34
	Total	83		

After the experimental application, the re-applied SPS Perception Scale was found to be 61.59 for the CG, and 68.30 for the EG1 and 69.04 for the EG2. SPS Perception Scale Post-test ANOVA Results in Table 13 shows whether these mean scores differ significantly.

Table 13. SPS Perception Scale Post-test ANOVA Results

Source of Variation	SS	DoF	MS	F	p-value
Between Groups	953.29	2	476.64	6.02	.004
Within Groups	6329.63	80	79.12		
Total	7282.92	82			

One-way analysis of variance on posttest mean scores on Table 13 showed a statistically significant difference between mean scores (p =.004 <.05). Scheffé Test was applied in order to identify the sources of this significant mean difference (Table 14).

Table 14. SPS Perception Scale Post-test Scheffé Test Results

Groups		Mean Difference	Std. Error	Sig.
CG	EG1	-6.71	2.29	.023*
	EG2	-7.45	2.39	.010*
EG1	CG	6.71	2.29	.023*
	EG2	-0.74	2.42	.954
EG2	CG	7.45	2.39	.010*
	EG1	0.74	2.42	.954

Scheffé Test Results show that the significant difference is in favor of EG's between CG and EG1 and EG2 groups. There was no significant difference between EG1 and EG2 groups (Table 14). According to these results, it can be said that the laboratory activities based on inquiry have a positive effect on the students' perception of SPS.

DISCUSSION AND CONCLUSION

This research showed that, social networking integration to the laboratory process enhanced the students' attitude towards the laboratory positively. Inquiry based activities alone also had a positive impact on students' attitudes but this contribution was not found statistically meaningful. Aydoğdu (2013) examined the effect of internet supported science and technology course on students' achievement, attitude and questioning skills and conceptions. He found that internet supported teaching method was more effective on students' academic achievement than traditional teaching methods and had a positive effect on their attitudes towards science and technology course, questioning learning skills and concept perceptions. There are different studies in the literature indicating that social networks, computer-aided and internet-supported learning environments positively affect students' attitudes towards the related course or learning environment (Clements, 2015; Pitiporntapin and Lankford, 2015; Soomro, Kale, and Zai, 2014; Villafuerte and Romero, 2017; Yeo, 2014; Yüksel and Olpak, 2015). These results are in line with our findings and support our results in some respects.

One other important finding of this research appears out to be is that students' perceptions about their SPS have improved with the interference of inquiry-based activities. It has been stated in the literature that inquiry-based approaches improve students' SPS (Greenwald and Quitadamo, 2014; Maxwell, Lambeth, and Cox, 2015; Molefe, Stears, and Hobden, 2016; Yaman and Yalçın, 2014). Myers and Dyer, (2006) examined the effect of inquiry-based laboratory approach on students' content knowledge and SPS. As a result of the study, it was seen that most of the students adopted the inquiry-based laboratory approach in terms of content knowledge and SPS. Tatar and Kuru (2006) stated that the inquiry-based learning process is applicable at all educational levels and every course from kindergarten to university. Windschitl (2000) also states that even the youngest elementary school learners have the capacity to engage in inquiry. In addition, as a result of the study, it was mentioned that there was a significant increase in the SPS of the students who took courses with questioning learning approach after the application compared to the pre-application. In another study, conducted by Koray, Köksal, Özdemir, and Presley (2014), a positive effect of creative and critical thinking-based laboratory activities on students' SPS was determined. Yang and Heh (2007) examined the effect of virtual physics laboratory applications on the achievement of physics, SPS and attitudes towards computer in the 10th grade students. As a result of the study, it was concluded that virtual laboratory applications have a more positive and higher effect on the SPS. Şimşek and Kabapinar (2010), in their work with primary school students; found that the science learning environment based on inquiry positively affected the students' SPS. For these reasons, to implement applications based on SPS rather than traditional laboratory applications was proposed. Additionally, we have found that social networking integration barely had an effect on students' SPS perceptions. This may be due to that no additional SPS activities were held on over the Facebook.

Based on the results obtained from this research, it may be advisable to provide teacher candidates with assignments and projects that will increase the use of internet for research purposes. These results show that, in applied science education, laboratory activities based on SPS, designed in accordance with the constructivist approach, may have important results for an effective science education when used with social media supported applications.

It can be stated that the correct learning and experience of inquiry-based learning approach for preservice science teachers will positively affect the future teaching life of the preservice teachers. This is vital especially when considering that the elementary science program was developed on inquiry-based learning approach. At this point, science teaching students are required to encounter more inquiry-based learning examples from the first grade to the last grade. It should be noted that interrogation practices may be different in the course and in the laboratory. It is important to present inquiry applications to students in different subjects, in different courses and in different learning environments.

In order to carry out inquiry-based practices in a healthy and productive manner, communication between teacher and the students have great importance even before the class. Being in touch with the students at any time with the help of social networks will be an important advantage at this point.

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