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Teacher Candidates' Perspectives about Applied "Basic Science in Primary Education" Course

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Abstract

This study aimed to investigate teacher candidates' perspectives about the 'Basic Science in Primary Education' course which adopted inquiry-based instruction approach. The participants of this study consisted of 87 teacher candidates (18 males, 69 females) who continued their education in the Department of Primary School Teaching at Çanakkale Onsekiz Mart University in the 2019-2020 academic year. A form which consisted of 5 questions was used to investigate the perspectives of the primary school teacher candidates about the science course called 'Basic Science in Primary Education' and to understand their opinions about the process of designing a course and applying course plans using an inquiry-based instruction. Descriptive codes were used to find out the opinions of the teacher candidates, which also helped analyse the data obtained from the form and interpret the results of the study. The results of the study showed that the teacher candidates shared their awareness and knowledge about teaching science effectively, which changed with this course. The teacher candidates also revealed that they learned the qualifications of teaching science effectively. In addition, despite the awareness that the teacher candidates gained about inquiry-based instruction approach, they shared that they struggled with planning and applying designed course plans. The study suggests that courses aiming to focus on science education ought to have applied practices beyond giving theoretical knowledge.

Keywords: Primary School Teacher Candidates, Inquiry-Based Instruction Approach, Basic Science in Primary Education Course

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Introduction

The information age brings rapidly changing living conditions that necessitates individuals to be trained as science and technology literate. Globalization will influence our future with changes in international economic competition and scientific developments. Individuals who have higher level questioning and problem-solving skills along with characteristics of seeking information, conducting scientific research as well as adopting and applying new innovations in their lives will be able to adjusted to globalization more than those who memorize information and knowledge (Çıray Özkara & Güven, 2018, Yetkin & Daşcan, 2008). Therefore, science education plays a key role in helping individuals gain this set of skills (Saraç & Capellaro, 2015). Consequently, the quality and practices of science education has been extended at every level of education (Balbağ & Karaer, 2017).

Although students are introduced to science concepts at kindergarten level in pre-school, systematic introduction of students to science education begins with science courses in 3rd grade in elementary school (Ministry of National Education [MoNE], 2018). Students, who are introduced to scientific concepts in 3rd grade, gain scientific knowledge and awareness regarding scientific concepts, which helps them develop a systematic scientific attitude toward their environment in the future and employ the knowledge throughout their lives (Akcanca, 2019; Ayvacı, 2018). Thus, primary school teachers are considered as role models since they play key role in training students in science and help them develop interest, knowledge, and skills toward science (Genç, Deniş & Demirkaya, 2010; Hacıömeroğlu, 2018). Researchers state that primary school teachers reinforce scientific literacy of students through high-quality science classes (Çıray Özkara & Güven, 2018). This fact puts emphasis on the training received by primary school teachers at undergraduate level when they are teacher candidate.

Education received by teachers at undergraduate level is associated with successful education and training along with improving career development for teachers and the quality of instruction (Riedler& Eryaman, 2016; Yurdakal, 2018). In 2018-2019 academic year, the Council of Higher Education made regulations in 25 undergraduate programs regarding the courses and content in order to align teacher education programs with the education system provided by Ministry of National Education (MoNE), to increase the quality in instruction and to comply with the needs of today's world. One such undergraduate program was primary school teaching. The changes made in primary school teaching curriculum included (a) decreasing total undergraduate credit hours from 178 to 150, (b) combining courses that were similar in terms of content, and (c) adding new courses that were needed. One of the new courses that was added to the curriculum was ‘Basic Science in Primary Education’. This course consists of basic physics, chemistry, and biology, which were offered as separate courses before the changes were adopted (Yurdakal, 2018). This course aims to offer primary

teacher candidates to gain conceptual and technical culture to be able to follow developments about scientific concepts along with gaining awareness about new innovations and concepts (Ayvacı, 2018).

Primary teacher candidates who complete science courses successfully at the undergraduate level are expected to have foundational knowledge and experience of science to deliver primary school science education curriculum effectively. The experience of delivering instruction is of course gained through teacher candidates' successful reflection to their teaching and integration of attitudes, strategies, methods, and technical knowledge with learned scientific concepts (Akben, 2018). Inquiry-based instruction is one such approach that has taken place in national and international literature in the recent years (Chairam, Klahan & Coll, 2015; Çıray Özkara & Güven, 2018; Hwang, Chiu & Chen, 2015; Tytler, 2015). Primary education science curriculum has adopted and applied inquiry-based instruction in Turkey since 2013 (MoNE, 2018). Primary education science curriculum applying inquiry-based instruction suggests conducting a series of structured inquiry-based activities in 3rd and 4th grades (MoNE, 2013). Structured inquiry-based instruction requires teachers to give directions about research problem and introduce the process of problem solving to students who are expected to solve the problem (Saka, Akcanca, Kala Aydın & Sungur Alhan, 2018). By using inquiry-based instruction approach, students are expected to investigate the problem using different lens, conduct research, and come up with a solution to the problem (Bulut, 2010). Thus, students can learn more abstract and hard-to-learn concepts with structured concrete concepts and be more motivated to participate in the class through productive thinking support they receive (Kılınç, 2007; Minner, Levy & Century, 2010; Wolf & Fraser, 2008). When this approach is adopted in courses, students develop inquiry skills such as collecting and analysing data, developing hypotheses and reasoning as well as advance high-level cognitive skills such as, exploring, discussing, and designing a product (MoNE, 2015).

Developing students' higher-level inquiry skills is possible with adoption of inquiry-based instruction approach in training of pre-service teachers and application of this approach in in-service teacher training (Saka et al., 2018). The literature, however, shows that primary school teachers or teacher candidates experience problems in delivering courses adopted inquiry-based instruction approach due to lack of knowledge about this approach (Alake Tuenter, 2014; Anagün, Kılıç, Atalay & Yaşar, 2015; Koştur, 2019; McDonald & Butler Songer, 2008; Ültay, Bıyıklı, Sungur, Topkara & Açici, 2019). Furthermore, the literature shows that primary school teacher candidates are anxious about teaching science courses (Akben, 2018) and in need of giving more examples (Duban, 2010).

Overall, the relevant literature shows that primary school teachers and teacher candidates experience problems in teaching science. Challenges and negativities experienced in teaching science are deemed as problems to train next generations who could contribute to the national economy. Researchers think that teacher candidates' experience in science education at the undergraduate level

influence their students' social and academic growth in the long run (Uzun & Başaran Uğur, 2018). Therefore, it is important to investigate teacher candidates' perspectives about the 'Basic Science in Primary Education' course, which is a new course that adopted inquiry-based instruction approach.

Purpose of the Study

This study aimed to investigate teacher candidates' perspectives about the 'Basic Science in Primary Education' course, which adopted inquiry-based instruction approach. Therefore, this study aimed to address the following research questions:

- What were primary school teacher candidates' overall perspectives about the 'Basic Science in Primary Education' course, which adopted inquiry-based instruction approach?
- What were primary school teacher candidates' perspectives about the processes of designing a course plan within the 'Basic Science in Primary Education' course, which adopted inquiry-based instruction approach?
- What were primary school teacher candidates' perspectives about the employing their designed course plans embedded in the 'Basic Science in Primary Education' course, which adopted inquiry-based instruction approach?

Method

This section includes information about research design, participants, data collection tool, data collection processes, and data analysis.

Research Design

This study, which aims to find out the opinions of the primary teacher candidates about the Basic Science in Primary Education course, was created in a qualitative pattern. Qualitative research is known as a type of method that is suitable for understanding, interpreting and suggesting better interpretations as it is carried out in a natural environment (Lichtman, 2006).

Research Participants

The participants of this study consisted of 87 teacher candidates (18 males, 69 females) who continued their education in the Department of Primary School Teaching at Çanakkale Onsekiz Mart University in the 2019-2020 academic year.

Inquiry-based instruction approach has been adopted and embedded in primary school science education curricula since 2013 in Turkey. Adopting this approach has required teachers in primary schools as well as primary school teacher candidates to be responsible for teaching science. Therefore, the 'Basic Science in Primary Education' course was chosen for this study because it consisted of

basic science education knowledge for teacher candidates. Accordingly, participants of this study were selected from the 1st grade of undergraduate students purposefully.

Data Collection Tool

To investigate primary school teacher candidates' perspectives about science course called 'Basic Science in Primary Education', a form that consisted of 5 questions was used. The form contained questions about primary school teacher candidates' overall perspectives about this course. In addition, the form consisted of questions specific to the teacher candidates' opinions about the process of designing a course and applying the course plans using an inquiry-based instruction. Questions included in the form were reviewed by two field-specific researchers and were finalized by the investigator after determining the content and construct validity.

Data Collection Process

In the beginning of the process, teacher candidates received a training about inquiry-based instruction approach for 4 hours. The training consisted of fundamentals of inquiry-based instruction approach, importance of this approach in science education, and the contribution of this approach to students. In addition, teacher candidates received further knowledge about the focus of inquiry-based instruction approach, the steps of this approach, the content of course plans using this approach, and application of course planning process. Training was enriched with presenting and reviewing exemplar course plans that were prepared by experts as well as watching videos about real-classroom environments where expert teachers deliver the content. Thus, teacher candidates gained more knowledge about this approach as this was a new concept for them. In addition, the investigator conducted one-on-one meetings with teacher candidates to review their plans and guide them about the steps in designing the course plans. Throughout these meetings, researchers helped them ask questions and recognize the missing pieces in the designed course plans.

After this training, the investigator determined appropriate learning outcomes selected from the science curricula for 3rd and 4th grade levels and environment for teacher candidates to apply the content, considering their level of experience. The learning outcomes determined by the investigator were distributed among teacher candidates randomly. Then, teacher candidates were asked to prepare a course plan for 40 minutes using inquiry-based instruction approach. Teacher candidates were also asked to deliver the prepared course plans in a classroom setting. Teacher candidates participated in this study completed all activities within 8 weeks during the 'Basic Science in Primary Education' course. At the end of the application, the teacher candidates were asked to fill out the form to evaluate the course.

Data Analysis

Descriptive codes were used to find out the opinions of the teacher candidates as well as to analyse the data obtained from the form and to interpret the results of the study (Miles & Huberman, 1984; Yıldırım & Şimşek, 2013). To address credibility in the study, %10 of the coding conducted by two experts were compared for consistency. Consistency between the two coders were found to be %86. The results of the study were presented systematically with a clear and understandable language to address transferability. To address transferability in the study, purposeful sampling was chosen and direct quotes from teacher candidates were provided when interpreting results. To address confidentiality and research ethics, primary school teacher candidates' names were not used, and they were enumerated and coded like Pri-P1 (Participant- Primary School Teacher Candidate) representing each teacher candidate

Findings

Findings of this study are presented in line with the research questions in this section. The analysis of participants' perspectives about various aspects of the 'Basic Science in Primary Education' course is presented in tables. Accordingly, Table 1 shows the results of teacher candidates' perspectives regarding their learning outcomes from the 'Basic Science in Primary Education' course.

Table 1. Teacher candidates' perspectives regarding their learning outcomes from the 'Basic Science in Primary Education' course

Learning Outcomes from the Course	**f**
Effective science instruction qualifications	22
Understanding the importance of group work	18
Knowledge about science at the basic level	18
Preparing course plan	13
Recognizing the lack of knowledge	12
Understanding the importance of the course	12
Learning scientific investigation	12
Relating science with daily life	15
Exploring nature	14
Science literacy	8
Understanding Inquiry-based learning strategy	7
Gaining questioning skills	7
Hands-on learning	3
Learning curriculum	3
Other*	6

*Other (Using time effectively, increasing motivation, developing cause and effect relationship, learning sub-disciplines, classroom management, preparing activities)

When Table 1 is examined, the teacher candidates stated that, thanks to this course, they gained knowledge about the qualities of an effective science teaching, acquired basic science knowledge and identified their lack of knowledge. Teacher candidates listed their learning outcomes and emphasized their learning about scientific investigation, understanding about the importance of group work, relating science with daily life, and learning through hands-on activities. In addition,

teacher candidates highlighted the benefit of this course regarding science literacy along with gaining knowledge about the primary school science curriculum and inquiry-based learning strategy. Teacher candidates' quotes representing their learning outcomes are as follow:

> "A primary school teacher must have excessive knowledge to transfer their students. Having knowledge only about Turkish or social studies course does not make a teacher complete… A primary school teacher must have a comprehensive knowledge to explain and interpret nature, its power, and natural activities happening around them." (Pri-P34)

> "Everyone in a society must take this course rather than a primary school teacher since everyone needs gain awareness. It is important to be aware of reasons, benefits, and causes of anything and everything we run into in daily life to implement practices accordingly. Teachers who play key roles in giving a shape into a society must also take this course to guide individuals in the society." (Pri-P46)

> "First and foremost, I think I have gained the basic level of science literacy. I have improved myself and my skills in interpreting daily facts through this course, especially about topics we utilize daily basis such as power, electricity." (Pri-P66)

Table 2 presents the results of teacher candidates' perspectives regarding negative aspects of the 'Basic Science in Primary Education' courss.

Table 2. Teacher candidates' perspectives about negative aspects of the course

Negative Aspects of the Course	f
Including many topics focusing on theory	18
Prejudice toward the course	12
Finding course contents hard	10
Having less course hours	7
Finding the topics boring	6
Consisting of three separate disciplines	6
Including small number of activities	4
Lack in pre-knowledge	2
Other*	4

Other* (Including abstract concepts, teaching high level of topic, based upon interpretation, teaching topics on surface)

As depicted in Table 2, teacher candidates thought that they had prejudice toward the course and lack of knowledge about science. The results showed that teacher candidates put emphasis on the negative aspects such as including many topics of the course focusing on theory and consisting of three separate disciplines (physics, chemistry, and biology). In addition, teacher candidates stated that understanding the course was hard without activities that required students' active involvement. Teacher candidates' quotes representing negative aspects of the course are as follow:

> "I think there are many theoretical topics in the course. It is hard to reinforce our learning about the topics taught in the course unless we have activities. There is a need to play active role all the time." (Pri-P31)

> "Primary school teaching program accepts students from social sciences concentration in high school and therefore, I think, students in the classroom have hard time due to the lack of background knowledge regarding this course." (Pri-P42)

Table 3 presents teacher candidates' perspectives about things to pay attention when preparing a course plan.

Table 3. Teacher candidates' perspectives about things to pay attention when preparing a course plan

Things to pay attention when preparing a course plan	f
Appropriateness to learning outcome	23
Finding research question	19
Appropriateness to the steps of Inquiry-based instruction	15
Appropriateness to student level	13
Arousing interest	13
Developing an entertaining course content	10
Selection of activity	9
Appropriateness of content to the aim	8
Measurement and assessment	7
Time management	7
Keeping students active	6
Other*	4

*Other (Having extensive knowledge, determining pre-knowledge, value education, hand-on experienced course plan)

As presented in Table 3, teacher candidates stated that they considered appropriateness of content to the aim, to student level, and to learning outcomes had importance when preparing a course plan. Teacher candidates highlighted the importance of including questions that ignite inquiry when selecting activities in designed course plans as well as appropriateness of the plan to the steps of inquiry-based instruction. In addition, teacher candidates highlighted the importance of time management for the selected activities in planning along with developing an entertaining course content for students. Furthermore, teacher candidates shared their perspectives regarding the importance of selecting measurement and assessment approaches in course plans. Teacher candidates' quotes representing things to pay attention when preparing a course plan are as follow:

> "Designed course plans must align well with the course content. It must convey students to research and questioning. Timing and content of the course plan must align and contents that call for longer course time period should not be limited to shorter course time periods." (Pri-P6)

> "…It is important to adjust the timing of the course, plan the class accordingly if any activities are implemented, and find activities that engage students in the activities individually when assessing students." (Pri-P31)

Table 4 presents teacher candidates' perspectives about challenges in planning and delivering a course.

Table 4. Teacher candidates' perspectives about challenges in planning and delivering a course

Challenges in planning and delivering a course	f
Selection of activities	18
Employing activities	18
Giving active role to students	14
Finding research questions	11
Time management	9
Unexpected questions	7
Coming across with new learning approach	7
Developing content of the course plan	7
Experienced negativity within the group	6
Appropriateness to student level	5
Evaluation	4
Limited pre-knowledge	4
Developing learning outcome-content relationship	3

As presented in Table 4, teacher candidates shared their challenges in planning and delivering a course designed with inquiry-based instruction. The two most common challenge were selection of activities and employing activities. Another challenge shared by teacher candidates was coming across with new learning approach and finding appropriate research question about this approach. These challenges were followed by giving active role to students, time-related problems, and experienced negativity within the group along with developing appropriate course content by considering learning outcome-content relationship. In addition, teacher candidates shared that they experienced challenges when teaching a topic due to limited pre-knowledge about the concept. Teacher candidates' quotes representing challenges in planning and delivering a course are as follow:

> "Because we have never prepared course plans focusing inquiry-based learning strategy, I was anxious about how well it would be. I constantly thought about how and what to do. I had hard time when coming up with solutions to the questions of how better we could teach the course more actively, how else we could engage students in the course, how activities should be. I questioned this so much in the beginning. But then I understood why when I saw the light in the students' eyes with curiosity about learning." (Pri-P20)

> "Students' reactions and feedback may not be dependent upon us; therefore, things may not be under control when delivering the course. And we were afraid to go beyond what we determined as the learning outcome of the course. In other words, it was hard to explain unexpected questions within the context of the planned course content." (Pri-P71)

Table 5 presents teacher candidates' perspectives about the changes in their thoughts about science after they took the 'Basic Science in Primary Education' course.

Table 5. Teacher candidates' perspectives about the changes in their thoughts regarding science at the end of the process

Teacher candidates' perspectives about the changes in their thoughts regarding science at the end of the process	f
Decrease in prejudice	19
Finding the course entertaining	17
Recognizing the lack in knowledge	7
Increase in interest to the course	9
Informing about science education	7
Relating science with daily life	6
Importance of applications in science education	6
Igniting curiosity	3
Awareness toward science course	3
Ability to think comprehensively	3
Openness to innovations	2
Other*	2

*Other (Awareness about the importance of inquiry, hardness of scientific course content)

As seen in Table 5, teacher candidates stated that their prejudice about this course and science decreased after taking the course. Teacher candidates shared that they found the course more entertaining and therefore, they had growing interest in the course. In addition, teacher candidates recognized the lack in their knowledge about science education and filled their knowledge gaps through this course. Teacher candidates also shared that they started gaining understanding about how to relate science with daily life, and importance of the course as well as its applications. The teacher candidates shared that the course ignited their curiosity and made them think more comprehensively and become more innovative. Teacher candidates' quotes representing changes in their thoughts regarding science at the end of the process are as follow:

> "None of the science courses we have taken so far (in high school, secondary school) has covered this much visuals and stuck in mind. I understood the fact that science was not as hard as frightening when supported with applications, although it is perceived as the second hardest course after mathematics. I saw that science could become a more understandable and entertaining course for students when it was taught with a non-traditional perspective." (Pri-P26)

> "…I don't think I will be one of those existing traditional science teachers. This course motivated me to try new applied approaches and methods to enhance knowledge of new generation." (Pri-P34)

Discussion and Conclusion

This study aimed to investigate primary school teacher candidates' opinions about 'Basic Science in Primary Education' course. The results of this study were interpreted in light of the relevant literature.

The results of this study showed that the teacher candidates shared their awareness and knowledge about teaching science effectively, which was changed with this course. Teacher candidates also shared that they learned how-tos of teaching science. In addition, teacher candidates stated that they recognized the lack in their knowledge at the basic level of science. Teacher candidates shared that they would use the knowledge they gained through this course throughout their career as a teacher. Akben (2018) found out similar results and stated that primary school teacher candidates felt prepared to teach science with applied practices and they gained a supportive experience of teaching science. The results of this study indicate that inquiry-based instruction approach provided an opportunity to teacher candidates to gain knowledge with experience rather than giving information directly. Accordingly, the results may indicate that teacher candidates' perspectives and level of knowledge changed positively toward science. In addition, this result might be related to the fact that teacher candidates participated in this study were in their first year of undergraduate program. This early introduction to inquiry-based instruction approach to teach science may be associated with the increase in their awareness about teaching as an occupation.

The results showed that teacher candidates highlighted the focus of science consists of three main disciplines (physics, chemistry, and biology) and the course contains theory-heavy content. In addition, teacher candidates stated that they had prejudice toward science. Uyanık (2015) found similar results and stated that primary school teacher candidates did not have enough knowledge about subject area. Uzun and Başaran Uğur (2018) conducted a study focusing on the anxiety of primary school teachers in teaching science and highlighted that teacher candidates needed to be supported not to be afraid of science courses. The research aligns well with the results of this study when considering the existing circumstances that call for primary school teacher candidates to fill the gap in knowledge about science within only one course. Despite this fact, teacher candidates stated that their prejudices toward science decreased through this course compared to their pre-course experiences. Teacher candidates shared that they found the course more entertaining and gained growing interest in the course and science. The literature shows that courses adopting inquiry-based instruction approach have increased students' interest in science and courses become more entertaining (Coşkun, 2018; Demirkıran, 2016; Suduc, Bizoi & Gorghiu, 2015). The results of this study indicate that teacher candidates might have felt like a professional teacher through employing the activities, becoming a role model, observing their peers, and evaluating the course. These engaging activities may have influence in the growing interest of teacher candidates in science.

The results of the research showed that teacher candidates think that they learned about the primary school science curriculum through this course. The literature, however, shows that there are studies found in-service teachers and teacher candidates the lack in knowledge about primary school science curricula (Balbağ & Karaer, 2017; Bölme, 2017; Ültay et al., 2019). Considering existing problems about curricula, it is noteworthy to state that teacher candidates thought they gained

knowledge about curriculum. This gained knowledge contributes to primary school teacher candidates' extensive knowledge about science curriculum that helps them use knowledge effectively and interactively as well as apply program-required qualifications in their classrooms (Halkai & Theodoridis, 2008). Despite the fact that teacher candidates shared the increase in their knowledge regarding the science curriculum, they shared their struggles in preparing appropriate, structured learning outcome-content focused course plans. Experience and lives of teachers influence their benefit from the curriculum (Bölme, 2017). Therefore, the results of this study may be explained with teacher candidates' limited experience as they were the 1st year undergraduates.

The results of this study showed that primary school teacher candidates struggled with preparing and applying course plans especially when choosing and preparing activities, although they had knowledge about inquiry-based instruction approach. This result aligns with the findings discussed by Bölme (2017), which emphasized the lack in knowledge about this approach and misuse of the activities. In addition, primary teacher candidates in this study emphasized the importance of using activities in the courses. The literature shows that primary teacher candidates conduct science courses theoretically rather than utilizing more applied practices and they shared their interest in seeing more exemplars (Akben, 2018, Duban, 2016). Having theoretical knowledge is not an indicator of that primary school teacher candidates would apply this knowledge effectively (Metin & Özmen, 2009). Therefore, the results of this study found to be normal given the conditions of teacher candidates delivered the course plans first time as they learned and practiced inquiry-based instruction approach. In addition, within the context of this research study, primary school teacher candidates gained extra knowledge and were exposed to practices of inquiry-based instruction approach, although the 'Basic Science in Primary Education' course was a 3-credit theoretical course. Accordingly, it is considered that applications have taken important place in teacher candidates' learning. The results of this study showed that primary teacher candidates had problem with finding appropriate research questions to inquiry-based instruction approach. Saka and colleagues (2018) found similar results and explained teacher candidates' ineffective skills in asking research questions. Because of the fact that teacher candidates did not have inquiry-based instruction approach applied to their training throughout the process as the courses were planned as oral presentation, the results of this study found to be organic results of this fact.

Primary school teacher candidates emphasized the importance of active involvement of students and active learning with hands-on activities in class. Science courses are defined as courses that require students to engage in activities through hands-on activities to structure knowledge (Çıray Özkara & Güven, 2018; Koştur, 2019). Different academic studies argue that activities that encourage the active participation of students have a positive effect on students' academic performance (Malefyane, Hofman, Winnips & Beetsma, 2014). In addition, primary school teacher candidates found the 'Basic Science in Primary Education' course adopting inquiry-based instruction approach

effective in associating science with daily life and understanding the nature. Çoşkun and Özata (2018) Yücel and Kanyılmaz (2018) emphasized the embedded aspects of science course within life and the possibility of applying knowledge in real-life. Teacher candidates offered new ideas to meaningfully interpret actions happening around their environments and conducted research by asking question to assess accuracy of the knowledge. Therefore, the results of the study indicated that teacher candidates used the knowledge they gained through these courses in real-life settings. In addition, primary school teacher candidates' emphasis on active engagement with hands-on activities may be explained with individuals' growing awareness through their experiences rather than memorizing knowledge.

Primary school teacher candidates shared that the 'Basic Science in Primary Education' course adopting inquiry-based instruction approach was helpful for them to learn about how to conduct research and become a science literate. The relevant literature shows that having science literate teachers is important to train next generations as science literate individuals (Çepni & Bacanak, 2002; Duban, 2010). In addition, instructional approaches defined as inquiry-based research are thought to be necessary to improve students' scientific literacy (Engeln, Mikelskis-Seifert & Euler, 2014). Through this course, primary school teacher candidates gained insights into preparing a course plan using inquiry-based instruction approach and experienced practices in applying the developed course plans. Accordingly, teacher candidates understood how to seek knowledge and interpret it. Therefore, the results of this study showed that this course was effective in developing skills and contributing primary school teacher candidates to become science literate individuals.

Despite the negativities primary school teacher candidates experienced within the groups in 'Basic Science in Primary Education' course, they shared that they understood the importance of working in groups and enhanced their communications skills within the group through this course. Tatar, Tüysüz, Tosun and İlhan (2016) and Hofstein and Lunetta (2004) found that inquiry-based instruction approach was effective for students in exchanging knowledge and brainstorming within the group to discuss and come to a conclusion for group activities. Accordingly, the results of this study showed that teacher candidates understood the communication within a group when listening to their peers or sharing their thoughts with peers in the group. The importance of understanding working in groups in the first year of undergraduate may contribute to primary school teacher candidates' involvement in group activities within courses in the following years in the undergraduate program.

Primary school teacher candidates shared their opinions in determining and applying measurement and assessment approaches. Academic studies reveal that primary school teacher candidates have problems in assessment and evaluation practices (Gök & Şahin, 2009; Güneş, 2007) and that they do not feel sufficient in determining appropriate assessment and evaluation tools (Metin & Özmen, 2009). However, teacher candidates must have extensive knowledge about various measurement and assessment tools to address whether they fulfil the needs and meet the expectations

of the target aimed in the course activities (Akben, 2018; Çepni, Baki, Ayas, Demircioğlu & Akyıldız, 2009). In this study, although the primary school teacher candidates realized that another factor as important as theoretical knowledge was measurement and evaluation, their lack of knowledge at this point was among the results of this research.

Recommendations

This study suggests the following recommendations based upon the results of this study.

•Courses focusing on basic level science education ought to go beyond the theory and include applied aspects in the content.

•Approaches adopted in primary education science curriculum (e.g., Inquiry-based learning, STEM) ought to be taught to teacher candidates in faculties of education within science education courses in depth.

•This study provided insights into primary teacher candidates' perspectives about science education courses throughout the process. Future qualitative study with primary school in-service teachers is needed to explore their perspective about science instruction.

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