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Student Teachers' Views of Science Microteaching: Experiences, Abilities, and Reflective Feedback

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This qualitative case study aimed to investigate primary student teachers' views of microteaching concerning their experiences, development of teaching abilities, and mentors' and peers' feedback. Thirty-six student teachers participated in this study. They were equally divided into six heterogeneous groups with six in each group. Each group of student teachers performed three science microteaching cycles for twelve weeks. Data sources consisted of student teachers' reflective structured-journals and verbatim transcripts of semi-structured interviews. The student teachers took the feedback seriously and struggled to improve their teaching practices in subsequent microteaching sessions. Based on their reflections, student teachers stressed the critical role of receiving constructive feedback to improve their science teaching and to become more reflective thinkers. On the other hand, most student teachers interestingly stated that there was no need to improve themselves in terms of the art of questioning and stressed that they felt completely at ease with it. They also regarded the skill of "*measurement and evaluation*" as less important than other teaching skills. However, fostering the skill of question-posing is considered very important for the development of high-order thinking skills. The possible reasons for this naïve perception were discussed.

Keywords: Feedback; Microteaching; Reflective practice, Reflective thinkers, Student teachers

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Introduction

Learning to teach science, both theoretically and practically, is a complex endeavor (Yoon, Kim, Sug-Kim, Jae-Joung, & Shin-Park, 2013). Dissatisfied with the outcomes of science teacher education programs, educators have recently integrated practical experiences into their coursework (Fernandez, 2005). In this context, practice teaching, workshops, video reflections, and demonstrations in schools are some promising approaches that offer teacher candidates with practical knowledge and understanding of educational theories (Yuksel, 2011). Abell & Cennamo (2004) suggest that utilizing classroom video reflection systems can bridge the gap between theory and practice and can help pre-service teachers link their lecture-based methodological knowledge with classroom practice.

The integration of video reflection systems into teacher education provides opportunities for activation and application of pre-service teachers' theoretical knowledge (Christ, Arya, & Chiu, 2017; Seidel, Blomberg, & Renkl, 2013; Walshe, & Driver, 2019). Bower, Cavanagh, Moloney, and Dao (2011) indicated that the video reflection process improved student teachers' presentation capabilities as well as an understanding of cognitive, behavioral, and affective dimensions of communication competencies such as listening, interpreting, and writing.

Theoretical Framework

As a well-known Video-reflection teacher education strategy for microteaching is as an effective method for professional training of pre-service teachers before full-time teaching (macro-teaching) in real school settings (Kpanja, 2001). Eksi (2012) believes that before teacher candidates participate in the field experience, teacher education programs should offer simulations of teaching to observe each other's teaching, give feedback, and engage in group discussions.

Microteaching education programs provide teacher candidates a well-established method of practice teaching in which participants have an opportunity to analyze footage of their own and peers' teaching in structured ways (Donnelly & Fitzmaurice, 2011). Microteaching also has the potential to enhance confidence in teaching and student learning (Kozan & Ata, 2019; Lumpe, Czerniak, Haney, & Beltyukova, 2012; Parasurama, 2019). Several studies have demonstrated that microteaching is a viable vehicle for meeting the desired goals of preparing teacher candidates to become more productive and reflective (e.g., Fernandez, 2005; Ferraro, 2000; Francis, 1995). Moreover, the sequence of student teachers first observing a video lesson and then providing an oral and written critique of instructional performance is a common practice that aims at encouraging critical analyses of teaching practices (Author, 2016a).

In recent years, many teacher education programs have attempted to reframe microteaching sessions by promoting critical inquiry and reflective practice (e.g., Fernandez, 2005; Ferraro, 2000). These programs shape and strengthen student teachers' teaching abilities by providing them with teaching practices and thoughtful feedback (Chawla & Thukral, 2011). Reflection, in this context, is identified as an internal feedback quest for information, according to Butler and Winne (1995). So, reflective feedback is a kind of feedback promoting internal questioning of their practices to promote their teaching competence and change their naive conceptions of teaching per their practices and suggestions (Davis & Dargusch, 2015; Yuksel, 2011). This dual process of reflection and feedback fosters professional practice by permitting practitioners to examine and evaluate the efficacy of their own or/and peers' teaching

(Marcos, Sanchez & Tillema, 2011; Pleschova & McAlpine, 2016).

In a microteaching session, when written feedback of the teaching performance follows oral feedback, the systematic development of the quality of the reflective practice (i.e., reporting, reviewing and refocusing, analyzing, re-conceptualizing) could be fostered (Campbell-Evans & Maloney, 1998; I'anson, Rodrigues, & Wilson, 2003; Korthagen, 2001). The feedback coming from peers or mentors also allows student teachers to focus on their teaching behaviors and trigger the development of specific teaching abilities. This principle of feedback leads student teachers to develop their teaching abilities and make them increasingly competent (Chawla & Thukral, 2011).

That is to say, setting up a collaborative environment for student teachers to observe and critique each other's teaching practices may provide them essential opportunities to develop their abilities to reflect (Yuksel 2011). Collaboration also builds self-confidence, increase awareness of learners, and make explicit the thinking underpinning their teaching role (Donnelly & Fitzmaurice, 2011). Furthermore, collaborative practice demonstrates how to give and receive positive and negative feedback (Race, 2001); and promote sharing experiences and ideas about teaching (Askarizadeh & Wan Mansor, 2011). Loughran and Corrigan (1995) have summed up thus: "Reflecting on experience is important so that student teachers have an opportunity to reconsider their point of view and to see the situation in different ways" (p. 568).

Diezmann and Watters (2006) also summarize three features of reflection as a tool for enhancing teaching practice. They are "components of reflection," "types of reflection," and "reflection through writing" (p. 4). The last of these features provides a theoretical framework for the current study. Writing narratives, journal portfolios, rubrics, and diaries are ways to stimulate reflection. These writing approaches can range from superficial engagement with ideas and experiences to deep engagement (Cheng & Chan, 2019; Diezmann & Watters, 2006). Campbell-Evans and Maloney (1998) argue that individuals should be encouraged to reflect deeply on ideas by working through writing cycles that progressively involve reporting, reviewing and refocusing, analyzing, and re-conceptualizing, which is the highest level of engagement (see Table 1). These levels of writing also indicate why some writing tasks lack challenges; for example, portfolios can fail to engage individuals in coordinated and critical thinking (Diezmann & Watters, 2006).

Table 1. Levels of writing

Type	Definition
Reporting	Describing; giving a factual recount of critical events, workshops, lectures.
Reviewing and Refocusing	Considering; making simple suggestions for alternatives; making plans for action; explaining; as in cause and effect; low-level questioning; reworking intentions and outcomes, making plans.
Analyzing	Interpreting events, problems or activities; making sense of an activity, situation or event; figuring it out and presenting a reasoned argument or answer; diagnosing a problem; comparing and evaluating; questioning answers and proposing follow-up actions.
Re-conceptualizing	Reworking views and ideas; drawing upon others' ideas and elaborating; stating a philosophy or vision of teaching a subject based on evidence, theory or valid experience; developing an image of teaching and teachers; insights into how students learn; stating a purpose for teaching a particular subject.

As cited by Diezmann and Watters 2006, p. 4 (Based on Campbell-Evans & Maloney, 1998).

Literature Review

A review of prior research indicates that developing reflective practice and feedback strategies for novice student teachers should be the primary goal of teacher education programs in order to promote competence in the classroom (Chetcuti, 2007; Diezmann & Watters, 2006; Griffiths, 2000; Marcos, et al. 2011; Lazarus & Olivero, 2009; Yoon & Kim, 2010). For example, Yoon et al. (2013) implemented peer teaching and reflection sessions with fifteen pre-service teachers. In Yoon et al.'s study, five teacher educators observed the pre-service teachers' peer teaching practices. Then, the teacher educators had a group discussion and gave feedbacks to the pre-service teachers about their peer teaching. Finally, the pre-service teachers revised their teaching plans and re-taught the lesson as a second peer teaching practice. The results revealed that although pre-service teachers were open-minded to the feedback that came from teacher educators, their views of inquiry-based teaching changed and were different from that of teacher educators.

On the other hand, researchers have designed strategies to develop reflective practitioners writing tasks specifically. They are journals (Bain, Mills, Ballantyne, & Packer, 2002; Francis, 1995), reflective essays (Demulder & Rigsby, 2003), reflective sketchbooks (Moate, Hulse, Jahnke, & Owens, 2019), self-reports (Boz & Adnan, 2017) or technology-oriented applications such as online blogs (Bower et al., 2011). For example, Bain et al. (2002) found that student teachers write journals primarily focused on the positive aspects of the feedback. However, feedbacks, combined with issue-related questions and comments designed to make student teachers that challenge and encourage alternative perspectives, would appear to offer a useful strategy for enhancing the effectiveness of journal writing. Francis (1995) concluded that journal writing provides opportunities for student teachers to focus on their teaching practices and to take their ideas they value into consideration as evidence of their own constructed knowledge.

Rationale

In Turkey, the student teachers are enrolled in university programs via central selection, using the results of placement exams. In the process of accepting students in primary school teacher education programs, examination results in language arts, social sciences, and math competencies are considered more important than proficiency in science. Not paying importance to science allows students to enroll in the primary school teacher education programs without the minimal program prerequisites in science literacy. Therefore, physics, chemistry, biology, and laboratory courses offered at the basic level in the context of primary teacher education program during the first two years of a four-year bachelor degree program may fail to provide students cognitive, affective, and psychomotor abilities related to the science subjects mentioned above.

As a result, poor development in the previous learning sciences may negatively affect the development of primary student teachers' teaching abilities. Moreover, most of the science courses students take are theoretical and taught through lectures, which leaves out the reflective component that only inquiry science would afford (Author, 2016b).

Aims and Research Questions

The lack of teacher reflectivity in traditional science courses points to the need for microteaching. The reason is a reflective mode enables student teachers to think about

the teaching of science that emulates scientific practices. Thus, the purpose of this study is to identify an on-campus peer microteaching program that promotes reflective practices and, in this context, to investigate the effects of the reflective process on the views of student teachers about their science teaching abilities and feedbacks given by mentors and peers. This paper also discusses how student teachers develop as reflective practitioners through self-analysis by watching a video of their teaching of a science lesson, and simultaneously mentors and peers providing them with oral and written feedback about their instructional performance. The researchers elicited student teachers' views of the microteaching sessions to achieve the aims, as mentioned earlier. A three-part research question framed this study: What are the primary student teachers' views of their microteaching (a) experiences, (b) development of teaching abilities, and (c) mentors and peers' feedback?

Method

Research Design

In this study, collecting, analysis and interpretation of data was conducted according to qualitative research methods. Qualitative research methods consist of different types depending on the object and purpose of the research. In the study, one of the qualitative research designs, case study, has been utilized to examine the teacher candidates' professional and reflective developments in a 12 weeks microteaching program. According to Merriam (1998), case study is a useful tool to gain definitions and analyses of one unit or one system which is limited to one individual program or group.

Participants

The study was conducted in a state university located in a southeast province of Turkey. The participants in the study consisted of teacher candidates who were in their final years in the Department of Primary Teacher Education during the 2012-2013 academic years. At the very beginning of the research program teacher candidates were divided into six heterogeneous groups in which there were six teacher candidates. Classification was done just at random, disregarding the equal distribution of gender between the groups. Participants ranged from 21 to 23 years of age. The participants had not experienced any microteaching applications in the courses they received before this study.

Procedure

The study was conducted during the "Science Teaching Methods" course. Teacher candidates were taught about the microteaching process and teaching skills. The microteaching videos of previous studies were watched and discussed with them. After this, which teaching skills would be focused on microteaching sessions in the study were decided by the researchers (mentors) and were notified to the participants. Subsequently, each teacher candidate was asked to prepare a lesson plan in which was taken into consideration these selected teaching skills (questioning, associating the topics with daily life, measurement and evaluation and content knowledge). After evaluating the lesson plans by the researchers, one of the teacher candidates in each group was randomly selected as the teacher of the micro-teaching group (called as StTeacher from this point), the rest of teacher candidates in each group have been assigned as the audience (students). It was formed according to the success of preparing lesson plans while forming student groups. Care was taken to ensure that being students preparing good, intermediate and bad lesson plans in each group. Each micro-teaching group met three times in total, with a researcher as their mentor at regular intervals for

twelve weeks to watch and criticize the micro-teaching sessions. That is, micro-teaching sessions have also made three times and each session, which has landed 15-20 minutes was recorded to video. StTeacher and the students of each micro-teaching group were asked to fill structured diaries before and after each micro-teaching session. Moreover, each group watched and criticized microteaching video of their own groups step by step with their mentors. Thanks to all these works, the teacher candidates were provided rich opportunities to make written and oral reflections about both themselves and their peers' teaching practices.

Data collection

The focus of this study was to provide detailed descriptions and analyses of each student teacher's views about his or her own and peers' microteaching practices, development of science teaching abilities, and mentor and peer feedback about the teaching performance. Thus, structured reflective journals and semi-structured interviews were used to capture student teachers' written and oral reflections, respectively.

Reflective journals

The design of structured reflective journal consisted of Campbell-Evans & Maloney's (1998) writing cycle that involves four stages (See Table 1): (1) deciding microteaching activities by reporting; (2) evaluating practices by reviewing and refocusing; (3) correcting by analyzing; and (4) reflecting by re-conceptualizing. Student teachers wrote their reflections in the researcher-structured reflective journal after watching each video during the microteaching sessions.

This study includes three of the stages given above (Campbell-Evans & Moloney, 1998). The fourth stage was excluded from the reflective journal because it did not align with the research questions. Student teachers filled out their reflective journals under three distinct categories as the following: "Introduction to Microteaching Practice," "Reflection on Microteaching Practice," and "Evaluation of Microteaching Practice." In the first stage, student teachers responded to the questions related to the self-evaluation of the microteaching sessions. They were asked to provide explanations as to why they chose the particular science topics, among others. They were also asked to discuss the teaching approaches and the reasons as to how they decided to choose an appropriate method for teaching a particular topic. In the second stage, student teachers responded to the questions related to the feedback received from peers and their interpretations of the feedbacks. They were also requested to note the situations they felt uncomfortable. Besides, they were asked to state teaching skills; they were incompetent while they were watching the videos together. In the third stage, student teachers responded to the questions concerning the changes they aspire to make to the presentations upon receiving feedback.

The reflective journals contained six statements grouped under three stages that elicited student teachers' views of microteaching before and after each session. An example of this (structured reflective journal) is presented in the appendix.

- ***First stage: Introduction to microteaching practice***

To be assigned as a student teacher to my group by mentors made me pleased/unpleased because...

I felt competent/incompetent in microteaching because...

I had no difficulty while improving my practices for the four teaching skills because...

- **Second Stage: Reflection on Microteaching Practice**

I think feedbacks are beneficial/unbeneficial to me during microteaching sessions because...

I prefer reading my peers' written comments about me without seeing their names because...

- **Third Stage: Evaluation of Microteaching Practice**

In which teaching skill did you take feedbacks mostly in the microteaching sessions?

Based on the following four questions, student teachers wrote down their views and gave feedbacks as they watched each video using descriptive analysis:

1. *How do you feel after you have given feedbacks?*
2. *What do you think about the feedback given by mentors on microteaching performances?*
3. *What do you think about your peer's performances?*
4. *What do you think you gained by giving feedbacks and reflecting?*

Interview Questions

In addition to the structured journals, semi-structured interviews were carried out with student teachers. The main point of this study was to provide detailed descriptions and analysis of each student teacher's views about their own and peers' micro-teaching practices and feedback and to detect their developmental perceptions on selected teaching skills.

1. *What are your views about the sessions of microteaching in which you actively participated?*
2. *In your view, how do you think the microteaching sessions affected your development of science teaching abilities?*
3. *What are your views about the mentors and peers' feedbacks about your microteaching?*

This paper highlights the feedback sessions and teaching skills during three peer-microteaching sessions for each group. Feedback sessions were utilized to share ideas, critically examine and reflect upon views about microteaching practices. Semi-structured interviews were audio-recorded and later transcribed.

Data Analysis

The data collected from the structured reflective journals and semi-structured interviews were analyzed using descriptive and interpretive methods (McMillan & Schumacher, 2010), namely, thematic content analysis (Glesne, 2012). In this way, researchers revealed specific themes by organizing and reorganizing the data. The data collected from semi-structured interviews and reflective journals were examined using thematic content analysis. In this way, researchers tend to reveal specific themes by organizing and reorganizing the data (Glesne, 2012). In line with Strauss and Corbin's grounded theory (1990), the researchers generated codes from the data. As well, taken into consideration were emergent codes derived from semi-structured interviews, and reflective journals to cluster and interpret the findings.

Reliability and Validity

One of the main prerequisites of qualitative researches is to provide the validity and reliability of the data. This study ensured the validity of the data by using multiple sources, including interviews and reflective journals. Anyone might be able to check the correctness of the data derived from reflective journals. Getting feedback following microteaching sessions is a way of implicitly ensuring the trustworthiness of data trustworthiness (Lincoln & Guba, 1985). Additionally, data were examined by four mentors that specialist in science education firstly individually, and then collaboratively in order to provide a tangible consensus about coding that further enhance data validity and reliability. Interview questions were presented to three experts to check their suitability to answer the research questions. Besides, these questions were also sharpened by two student teachers to check for clarity. The researchers administered the final version of the interview form to student teachers in the sample. To ensure the reliability of the interview form, researchers coded views individually. The agreement rate among the researchers was determined. This ratio was calculated using the reliability formula of Miles and Huberman (1994) (Reliability Formula: Consensus / Consensus + Disagreement). The inter coder reliability of the study was found to be 0.81. Intercoder reliability coefficients range from 0 (complete disagreement) to 1 (complete agreement), with the exception of Cohen's kappa, which does not reach unity even when there is a complete agreement. In general, coefficients .90 or greater are considered highly reliable, and .80 or greater may be acceptable in most studies (Neuendorf, 2012).

Results and Discussion

Findings are reported based on the primary student teachers' views of microteaching in response to the three-part research question on their: a) experiences, (b) development of teaching abilities, and (c) mentors and peers' feedback.

Student Teachers' Views of Their Experiences

Although the student teachers stated that they were much concerned and felt fearful because of their lack of teaching experience, they were delighted to be selected to participate in microteaching. Note an example below:

Gul (female): *“At first sight, I thought I could not achieve it. However, then, as changing my mind, I realized it would be enjoyable. Moreover, it forced me to do it voluntarily.”*

Only three out of the 36 student teachers felt competent before microteaching. However, all student teachers stated that they believed in being successful in microteaching. See examples below:

Gul (female): *“I feel pretty competent myself. Because I believe I can do my best. At least, I believe I will be able to make an effort to develop my capacity to teach.”*

Bur (male): *“I am not fully competent, but I believe I can achieve this by raising my capacity.”*

Es (Female): *“Any teacher should possess four teaching skills, as mentioned before.”*

Student teachers were asked to rank order the science teaching skills in terms of

importance. They focus on: (1) "Content knowledge"; (2) "Asking questions"; (3) "Associating knowledge with daily life"; and (4) "Measurement and evaluation." Student teachers stressed that they felt completely at ease with the skill of "Asking questions" and "Associating knowledge with daily life" during microteaching." However, they argued that they did not have to show their best efforts in the preceding two areas. Mike gives his reasoning:

Mik (male): *"I did not need to show much effort while I was giving some examples from daily life and questioning. Because there were numerous examples already given in the textbooks."*

When student teachers were asked to state their views about the mentoring sessions, they expressed both positive and negative points. They also made suggestions for improvement and noted concerns about mentors (see Table 2). There were four suggestions: (a) assigning several tasks for micro-teaching; (b) providing equal opportunity to express views; (c) charging students with outdoor works, and (d) allowing each student to practice teaching. There were three significant concerns about mentors: (a) exacting behavior, biases toward students, and expectations of compulsory learning outcomes.

Table 2. Student Teachers' views of science microteaching

Categories of Views	f	Student Teachers' Expressions
Increasing self-confidence	3	<i>"I realized that I was able to be a good teacher. I had an opinion that I could not be able to teach as a profession. I no longer stick to this opinion. I understood that I could become a teacher if I work hard."</i>
Waning excitement	3	<i>".....I was excited at the start of the course. However, it decreased gradually over the next microteaching practice. I get less excited about other courses from now on."</i>
Encouraging novel methods	2	<i>"I was widely criticized because of my lecture-like presentation in my first video. Therefore, I learned some of the novel methods to deal with these overrated critics. Quite frankly, I was surprised to see many methods that I had never heard about."</i>
Lasting too long	2	<i>"It lasted too long to record three videos and to gather three times for receiving feedback. To find out the suitable day for these tasks and to gather round prolonged the time."</i>
Feeling exhausted	2	<i>"I was quite relieved when the microteaching was over. I felt exhausted because of the given tasks."</i>
Assigning repeated tasks	3	<i>"I think we should be involved in a variety of tasks. We got tired of the same things told by our mentors."</i>
Expressing views not by all	4	<i>"I observed that only some students gave feedback about mentoring. I think all the students should have stated their views."</i>
Filling only the journals	5	<i>"Some of our friends did nothing except giving feedback and filling out the reflective journals. They would have studied the topics and found some examples to give us supportive ideas."</i>
Giving opportunity for all	3	<i>"During the microteaching process, we learned a lot. If only our friends would find the chance to join us to participate in the microteaching sessions as a student teacher."</i>
Exacting mentor behaviors	5	<i>"My mentor was highly perfectionist. Therefore, we often had to make revisions. So, we got drained."</i>

Exhibiting mentor biases	4	<i>"My mentor consistently interrupted me and gave me the order that I failed the process. I was given many reminder notes during the practice."</i>
Repeating the same topics	4	<i>"It was full of nonsense to teach the topic already given based on compulsory learning outcomes. We should have the right to choose. However, I enjoyed working on the learning outcomes related to daily life."</i>

At the very beginning of the microteaching sessions, student teachers stated that they had no confidence to teach, but they were excited. However, the student teachers noted that their excitement waned soon after. On a positive note, they mentioned that their self-efficacy increased because of making a video of each of their presentations, trying out various methods of teaching the subject, and continuously changing teaching methods upon feedbacks. By the end of the micro-teaching, student teachers stated that they were very exhausted because of their engagement in tasks that were so intensive and time-consuming.

When student teachers were asked to evaluate the whole sessions of micro-teaching, they made suggestions and pointed out concerns for improvement. Student teachers suggested that each of them should be given more tasks and also actively involved in the tasks assigned. They pointed out that those who do not participate in the microteaching sessions should be encouraged to be more active. Such experiences are necessary for becoming a teacher. The two most referred issues were instructors' meticulous mentoring and exercise of strict controls on the tasks provided.

Additionally, the instructors had no intention of allowing student teachers to select teaching methods they wished to improve. It was one of the compulsory enforcement. Student teachers who had never been in the sessions of micro-teaching had to meet with the mentors continuously because the mentors wanted to have a heavy hand on them. Although they received feedbacks after their conversations with their mentors, they would have gotten into trouble if they had not worked hard on the levied tasks. Moreover, student teachers pointed out that the mentors they already knew through other courses had biases toward them. The student teachers did not view the mentors positively.

Concerning the microteaching sessions, student teachers stated that they were not pleased about being forced to choose the subject and teach it following the teaching methods proposed by the mentors. Because of their negative micro-teaching experience, student teachers may be non-resilient to teach science with the mentors' imposed methods.

Table 3. Student teachers' views of their development of teaching abilities

Categories of Views	f	Student Teachers' Expressions
Becoming aware of extensive knowledge	5	<i>"Although I choose the subject that I was good at, I realized that I did not know it to the extent that I thought before."</i>
Reducing concerns about knowing scientific content	4	<i>"Feedbacks that I received after my presentation provided different examples and questions that decreased my concerns about scientific knowledge."</i>
Teaching-as-teacher	2	<i>"In the course of presentations, I felt as a teacher. I got excited, as well. I tried to behave like a teacher asking questions to anyone."</i>

Learning many method	3	<i>“Due to my mentor did not like my method to teach my subject, I had to try various methods. In this way, I learned many methods.”</i>
Fearing to teach science	2	<i>“I had a fear of teaching science subjects. However, I understood they were not as hard as I thought before, and it was easy to grasp.”</i>

When student teachers were asked to evaluate the development of their teaching abilities, they stated that they improved in science content, learned how to teach science, and developed their methods of teaching. They highlighted that they learned how to choose the best method when given feedback about the methods they used to teach science. They noted that their efforts to teach science provided them with valuable experiences in becoming a teacher of science. They also put forward the notion that they had opportunities to recognize their self-efficacy. As their recognition of their self-efficacy increased because of the feedback they received, the student teachers stated that their concerns about teaching science subjects decreased.

Student Teachers' Views of the Mentors and Peers' Feedback

Many student teachers stated that getting feedbacks and watching their video practices were beneficial, and they were so pleased to be exposed to peers' and mentors' constructive feedback. That is, they stated that the sessions of watching videos and receiving feedback after each microteaching allowed them to evaluate and to make amendments to the mistakes in a thoughtful way. Note examples below:

Miz (female): *“I think it is useful. Because I was not able to recognize my mistakes during my performance.”*

Mik (male): *“It was nice to correct my mistakes by getting constructive feedback and watching my microteaching practice.”*

Student teachers stated that they would prefer reading their peers have written or oral feedbacks directed to them without seeing any names as long as the feedback would not be harsh and unfair. See examples below:

Gul (female): *“It does not matter actually. The most important issue here is that mentors make us realize our incompetence.”*

Miz (female): *“Their names do not have to exist on the paper. If they were beneficial, constructive, and reasonable critiques, I would try to correct my mistakes. I think the main purpose of the microteaching sessions is to bring about the most improved self-video thoughtful, constructive critiques and feedback received. No matter how mentors expose us to these critiques or feedback.”*

Student teachers stated that they received the most feedback in the art of questioning. Besides, looking at the second statement above, questioning is in second place about the significance of all statements. However, surprisingly, student teachers stated that they found questioning difficult. Note Mik's reasoning:

Mik: *“My peers continuously warned and criticized me about questioning and connecting the subject to daily life. They did not like my performances at all. I had to make too many revisions.”*

Student teachers provided their views on feedback as they watched each video and used descriptive analysis. Student teachers stated in their reflective journals that they enjoyed

watching videos because of the feedback. They also added that they improved because of sharing their views, giving and receiving feedback, prior scaffolding knowledge with new and more accurate ones, gaining experience because of receiving feedback, and self-criticizing more deeply. Note the examples below:

Se: *"I gave feedback too many times. I believed that I gained teaching experience as a student-teacher. I am now sure how to get in the classroom and how to begin teaching the subject."*

Oz: *"I criticized myself for my teaching skills because of feedback. I had fun, and it was a great pleasure for me."*

Ays: *"I feel that I got more knowledge as I shared my views. It is good for us to correct our mistakes. It made me see how I am competent at teaching the subject."*

Student teachers were asked to write down their views of the mentors' feedback in their reflective journal after watching each video. Student teachers believed their mentors gave feedback at the right time during their microteaching. However, they added that mentors often criticized them, and their manner of talking sometimes frustrated them. See the examples below:

UH: *"Their views and suggestions about teaching performances on videos were of value and constructive."*

Hsn: *"I am pleased that mentors gave feedback to us. As well, they took into consideration our feedback."*

Ab: *"Feedback was sometimes harsh. However, the feedback was quite constructive. Also, mentors declared our incompetency. They supported us with their valuable feedback. Therefore, it made me happy."*

Student teachers stated that they had to make better observations and evaluate themselves critically to give constructive feedback. Besides, they emphasized the fact that they developed their ability to interpret and learned to predict possible feedback over time.

Cs: *"There were positive contributions. I recognized my competency by comparing my skills to those of others. Besides, I imagined how to practice better by watching others. In this way, I realized what I need to do more."*

As: *"I think it was useful. We better understood on which skills we should focus my peers and I was teaching the subject."*

Sc: *"It was useful. I developed myself to some extent, almost in each skill. I learned what kind of competencies I would need in my professional career. I practiced how to facilitate these competencies in the classroom and to reflect."*

Discussion and Conclusion

It is imperative to mobilize high-level thinking and decision-making processes in the development of the teaching skills of student teachers. In this study, we focused on reflective feedback processes based on microteaching in teacher education. Thus, it was aimed to develop student teachers' both conceptual and practical understanding of science teaching skills through reflective sessions of microteaching procedures. They were encouraged to think about the feedbacks, produce solutions, and develop creative ideas for better teaching practice. Student teachers' thinking on their practices and developing creative ideas for better teaching, provides valuable experiences for new

research on how we develop or direct creative and reflective thinking.

When student teachers were asked to evaluate the whole microteaching sessions, one of the most preferred issues was meticulous mentoring and strict controls by instructors on their tasks. This practice could stem from mentors' unconscious or perhaps conscious behaviors. As a result, giving excessive tasks to peers in the process of the microteaching sessions might have forced them to feel over-worked while practicing. This behavior could have brought up their first negative emotions (worry or excitement). However, student teachers got rid of these negative emotions over time, and they were involved in the sessions. According to student teachers' writings in their reflective journals, only three Student teachers felt competent enough before microteaching sessions. However, they all stated that they believed in being successful during the sessions. Therefore, we may infer that microteaching sessions provide opportunities for student teachers to develop their science teaching abilities.

The findings of this study showed that providing oral and written feedback through the instrument of watching microteaching sessions have a positive effect on the student teachers' confidence in science content and science teaching. This result is consistent with several studies, demonstrating microteaching is a viable vehicle for meeting the desired goals of preparing student teachers to become more productive and reflective teachers (Campbell-Evans & Maloney, 1998; I'anson, et al. 2003; Korthagen, 2001). Race (2001) has suggested that setting up a collaborative environment for student teachers to observe each other's practice in microteaching sessions provides the opportunity to build their self-confidence. The student teachers' confidence about pedagogical content knowledge in science affected positively in this study concur with Race (2001). Youens, Smethem, and Sullivan (2014) concluded that using video capture to generate the agenda for the learning conversation ensures the opportunity to analyze and reflect on the lesson.

According to the findings of semi-structured interviews (see table 3), student teachers stated that their awareness and levels of science content knowledge and application knowledge and skills of science teaching methods were positively affected. When we examined student teachers' writings in reflective journals, we found that proficiency in "content knowledge" as the most critical aspect that influenced teaching positively. There are several studies in the literature revealing that content knowledge is one of the critical factors affecting the teaching of science. The results of this study showed that content knowledge had a positive influence on effective teaching, which is also reported by Gess-Newsome and Lederman (1995). The most crucial educational need stated by student teachers was content knowledge about students' understanding of science. This result is consistent with the literature (Adams & Krockover, 1997; Schempp, Manross, Tan & Fincher, 1998; Stacey, Helme, Steinle, Baturo, Irwin & Bana, 2001). In a case study, Koballa, Glynn, Leslie, and Coleman (2005) investigated three novice teachers' conceptions of teaching science. Findings elicited that novice teachers believe knowing the content was a compelling force in guiding their classroom practice. Moreover, their teaching practices appeared more consistent with the conception of "science teaching is presenting science content to students.

On the other hand, most student teachers interestingly stated that there was no need to improve themselves in terms of the art of questioning and stressed that they felt completely at ease with it. They also regarded the skill of "*measurement and evaluation*" as less important than other teaching skills. However, fostering the skill of

question-posing is considered very important for the development of high order thinking skills (Sasson, Yehuda & Malkinson, 2018). This point of view of student teachers leads us to think that they are unaware of the importance and difficulty of qualities of questioning in the teaching sessions. As echoed by many studies, teachers often spend most of their teaching with low-level questions involving factual knowledge and memorization (Author, 2013; Erdogan & Campell, 2008; Wilen, 1991). So, student teachers coming through this kind of teaching from elementary school to university may typically be unaware of how to ask high-quality questions that can stimulate productive thinking and what that means (Ruiz-Primo, 2011). This unawareness would make them think about the questions included in the textbooks are sufficient for teaching. However, research has documented the correlation between the effective questioning practices of teachers and students' critical thinking and achievement (Erdogan & Campell, 2008; Savage, 1998).

Consequently, it is more likely that student teachers will intellectualize the endeavor of thinking and reflecting further on questioning might be a futile attempt. Student teachers enjoyed more taking beneficial, constructive, and consistent feedback in which the mentors offered reasons and solutions. After the feedback, student teachers still struggled to improve their subsequent microteaching and reflections. Student teachers believe that they need constructive feedback from mentors or peers to improve their teaching skills. Feedback is instrumental in improving teaching skills throughout their careers (Pajares, 1992). Many studies imply the crucial effect of taking feedback to improve teaching and reflection skills (Fernandez, 2005; Ferraro, 2000; Francis, 1995; Chawla & Thukral, 2011; Pajares, 1992; Butler & Winne, 1995; Chetcuti, 2007; Diezmann & Watters, 2006; Griffiths, 2000; Marcos et. al., 2011; Lazarus & Olivero, 2009; Yoon & Kim, 2010). Brouwera, Besselink, and Oosterheert (2017) revealed that video feedback on teaching skills could contribute to filling the gap between theoretical knowledge and practice development in pre-service teacher education. Yuksel (2011) argued that peer feedback, even after micro and micro-teaching practices, had a positive effect on changing the student teachers' beliefs through critical reflection. Eksi (2012) also stated that the importance of giving feedback and engaging in discussions to improve one another's instructional behaviors in microteaching sessions. Reflective teaching is a means that teachers can develop a higher level of self-awareness about their actions and behavior while teaching (Convery, 1998).

Student teachers who gave feedback to student teachers' microteaching practice stated they were privileged to be able to give feedback. As well, they consistently learned much about self-evaluation during reflection. Student teachers stated that they found feedback received by mentors as necessary and useful. As well, student teachers compared their growth as noted in their journals. As supported by Kuswandono (2014), collaborative reflection offers an alternative path to deepen reflection for student teachers. Collaborative reflection occurs in a collectivist culture that motivates individuals to congregate in groups without merely engaged in reflective practice.

Recommendations

This study contributes to our understanding of the relationship between student teachers' reflective feedback practices and science teaching abilities. Student teachers emphasized the critical role of receiving feedback to improve science teaching activities and reflection skills. Because of microteaching activities, student teachers had opportunities to re-construct their pedagogical content knowledge. However, strict controls by

mentors and imbalanced distribution of roles on microteaching sessions are prone to critique. Finally, the last two findings of the study have an implication. The further investigation involves student teachers' thinking that there is no need to improve on questioning skills and the "measurement and evaluation," and their view that these are the least essential skills. More qualitative and longitudinal studies would elicit and improve student teachers' perceptions of the aspects mentioned.

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REFLECTIVE JOURNAL

A. Decision-making phase for micro teaching practices

My choice as the practitioner of the micro-teaching group made me happy / unhappy. Because:

I feel enough / insufficient for this application. Because:

I had more difficulty in preparing for Because:

I did not have much difficulty in preparing for the in five skills areas. Because:

I think the five skills areas that a teacher should have are important for the teaching profession. Because:

When I was choosing a subject, I tried to choose a subject from physics / chemistry / biology. Because:

I chose topic Because:

I thought the location would be more appropriate for describing the method I chose teaching. Because:

MICRO TEACHING JOURNAL Sayfa 1

REFLECTIVE JOURNAL

B. EVALUATION PHASE OF MICRO-TEACHING PRACTICES

I think/ I don't think it is very useful to me to give feedback in micro teaching practices. Because:

I would prefer to read my friends' comments on a piece of paper without their names. Because:

I bother me /I didn't bother me to get feedback verbally. Because:

Watching myself in the video made me feel the following emotions:

Watching myself in the video made me feel the following emotions:

MICRO TEACHING JOURNAL Sayfa 2

REFLECTIVE JOURNAL

C. REFLECTION STAGE OF MICRO-TEACHING PRACTICES

After feedback on micro teaching practices, I reorganized the following:

My practice as planned in the classroom work/ did not work. Because:

I used during class performance: a) method by plan d) Material was incorrect. Because:

I have made constant changes at Because:

If I were to repeat the course on the same subject, I would use a) method by plan d) Material during my performance in class. Because:

MICRO TEACHING JOURNAL Sayfa 3