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Exploring Prospective Teachers' Reflections in the Context of Conducting Clinical Interviews

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Abstract: This study investigated prospective mathematics teachers' reflections on the experience of designing and conducting one-to-one clinical interviews with middle school students in the context of an elective course on use of video in teacher learning. Prospective teachers were asked to write about weaknesses and strengths in student understanding as well as their own performance as an interviewer in terms of asking questions and responding to student thinking in their reflections on conducting clinical interviews. Furthermore, prospective teachers were also asked to reflect on what they would do differently in order to conduct better clinical interviews. Nature of prospective teachers' reflections were analyzed by using existing frameworks (through constructs of reflection-on-action and reflection-for-action) and by using thematic analysis. Results of data analyses revealed that prospective teachers had more difficulties in providing meaningful reflection-for-action which was related to alternative decisions and planning for future similar interviews. Thematic analysis results revealed prospective teachers' learning were grouped under three categories: conducting clinical interviews as part of being a teacher, complexity of conducting clinical interviews, and personal theories about middle school students. There are implications for both teacher learning and research.

Keywords: *Prospective mathematics teachers, reflection skills, clinical interview.*

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Introduction

Research and policy recommendations on teacher learning put emphasis on student-centered instruction and implementing cognitively-high demanding tasks in mathematics classrooms (Stein, Engle, Smith, & Hughes, 2008). Student-centered instruction requires that in the midst of a complex and dynamic classroom environment teachers understand what is important and what is not in terms of both mathematics and students' thinking, and act in a way that is responsive to students' needs while maintaining a focus on the learning goals. Previous research has identified these skills as professional noticing skills of teachers (Jacobs, Lamb, Philipp, & Schappelle, 2011). Professional noticing skills are in general conceptualized as *attending to student thinking*, *interpreting different ways of student thinking* and *deciding to respond in a way that builds on student thinking*. These skills are not only indicative of teachers' pedagogical content knowledge (Shulman, 1986) but also closely related to professional vision of teachers (Goodwin, 1994), a unique way of how teachers view, interpret and predict complex classroom situations in a professional way (Meschede, Fiebranz, Moller, & Steffensky, 2017).

Teachers are recommended to engage in practices of eliciting student thinking with their questions and invitations (Franke et al. 2009; Sahin & Kulm, 2008) and also follow up in a way that is supportive to student learning (Cengiz, Klein, & Grant, 2011). As teachers implement cognitively high-level tasks where there is not one single right answer but many different pathways of making sense of the same problem, different representations and solution ways as well as student misconceptions emerge. With such recommendations in mind, teachers should develop their skills in noticing and making sense of student thinking so that they can respond to student thinking in ways that they can support and ideally extend student thinking (Cengiz et al., 2011). Such practices demand not only experience in working with children but also conscious reflection on teachers' own actions as they engage in working with students in a responsive way. Jacobs and Empson (2016) conceptualized responsive teaching in the following way: "teachers' instructional decisions about what to pursue and how to pursue it are continually adjusted during instruction in response to children's content-specific thinking instead of being determined in advance" (p. 185). In order to help teachers develop

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responsive teaching skills teacher education practices need to incorporate experiences where prospective teachers (PSTs) engage with students' different ways of thinking and reflect on their ways of interacting with students.

One of the frequently used ways in order to support PSTs' knowledge of students and helping them understand student thinking in better ways has been the use of conducting clinical interviews (Ginsburg, Cami & Preston, 2010; Jenkins, 2010; Moyer & Milewicz, 2002; Schorr, 2001; Weiland, Hudson, & Amador, 2014). Clinical interviews are in general designed to provide insights into what students think about a specific topic (Ginsburg, 1997). The goal of a clinical interview is not to teach, evaluate or change student thinking during the interview but rather understand details of student thinking. While experience at school sites and interacting with students in authentic contexts help PSTs learn about student thinking and ways to respond to them, clinical interviews enable PSTs to focus on student thinking and mathematics content alone (Crespo & Nicol, 2003; Moyer & Milewicz, 2002). In this way, a PST's attention is not distracted by classroom management problems or general context, which is a common issue for novice teachers (Kagan, 1992).

This study documented prospective mathematics teachers' clinical interview experiences before fieldwork. One of the goals of the teacher education program studied in this paper is to help PSTs become reflective practitioners. By reflective practices, PSTs can structure and make sense of their experiences related to teaching and learning and transform them in becoming better professionals (Schon, 1983). In this context, this study investigated the following research question:

How did prospective middle school mathematics teachers reflect on the experience of designing and conducting one-to-one clinical interviews with middle school students?

Literature Review

Clinical Interview Method

The origin of clinical interview method goes back to Piaget (1952) who introduced this method in order to develop insights into children's thinking. The underlying principle of clinical interviews is developing a specific task and predetermined questions that will engage the student and allow the interviewer understand student thinking about a specific topic. The process of conducting clinical interviews is flexible and requires the interviewer to probe and ask questions according to students' responses. Being able to respond to student thinking in supportive ways or even extending student thinking requires that interviewers are not only well prepared to anticipate possible student conceptions, but also act according to student thinking during the moment of the interview (Jacobs & Empson, 2016). Such skills are closely related to pedagogical content knowledge (Shulman, 1986) and professional noticing skills (Jacobs et al., 2011), and may potentially help prospective teachers implement responsive and student-centered instruction in mathematics classrooms when they become teachers (Moyer & Milewicz, 2002; Weiland et al., 2014).

Interacting with students either one-to-one or as a whole class is an important component of teaching and learning. In both cases, the interviewers need to know what kinds of questions to ask, interpret student understandings and responses, clarify or challenge students' thinking, and follow up based on student performance, adjusting the level of their questions (Jacobs & Empson, 2016; Weiland, Hudson & Amador, 2014). Moyer and Milewicz (2002) argued that conducting one-to-one interviews with students prepare PSTs for managing whole class discussions which is rather complicated compared to one-to-one interactions:

"Developing skills of questioning and responding to students is an important way of preparing to learn conducting mathematical discussions in a more unpredictable classroom environment where teachers have to attend to, interpret and respond to different types of student thinking in a simultaneous way" (p. 24)

From this perspective, clinical interviews can be considered an important aspect of teacher learning.

Previous studies documented that teachers who learned how to conduct clinical interviews and implement in different ways considered conducting clinical interviews as a beneficial professional development experience (Ginsburg, Jacobs, Lopez, 1998; Schorr & Ginsburg, 2000). It is also important to understand how clinical interviews may help prospective teachers in developing similar skills since PSTs in general may need more support due to their lack of experience and knowledge of learners. Few studies which investigated PSTs' conducting clinical interviews in terms of their questioning or beliefs about teaching revealed that they benefited from the experience (Moyer & Milewicz, 2002; Reinhold, 2016; Schorr, 2001; Weiland et al., 2014).

There are benefits of conducting clinical interviews for prospective teachers' knowledge and beliefs. For instance, in a study conducted by Schorr (2001), PSTs who conducted clinical interviews in a teacher education class changed their beliefs about teaching mathematics. In particular, PSTs noticed the students were able to invent their own strategies and that the students' right answers did not indicate they had an understanding of the concept. The findings of Jenkins (2010) revealed that conducting interviews may help prospective teachers develop their knowledge of students' mathematical thinking and improve skills of listening to students which is an important aspect of teacher learning. The benefits of the process were found as limited due to the nature of structured interviews. Moyer and Milewicz (2002) found that PST questions during the clinical interviews had room for development but that PSTs were able to ask

different types of questions. PSTs had a difficulty in asking probing and follow up questions and tended to instruct students with their questions. In other words, PSTs omitted asking questions such as "how did you find the answer?" or "why did you use this strategy?" after hearing student answers. In clinical interviews, asking such questions are not only essential in order to gain a picture of student understanding but also a sign that PST is paying attention to student responses. Although PST questions in general were not considered competent, data indicated a variety of questions used by PSTs. Additionally, the researchers observed beginning characteristics of competent questioning in some of the PSTs who participated in the project. Weiland and colleagues (2014) also explored development of PST's questioning skills after they were trained in conducting clinical interviews. The results of this study indicated that PSTs improved their ways of questioning after weekly practices and reflections. Similar to what Moyer and Milewicz found, the PSTs in this study struggled in asking probing questions and tended to ask leading questions, which could not inform them about student understanding. Admittedly, allowing students to express their ways of thinking and asking questions to elicit student thinking instead of leading them to the right answer or giving immediate feedback is a challenging practice, especially for the PSTs (Franke et al., 2009; Mewborn & Huberty, 1999). In summary, previous studies on clinical interviews focused on PSTs' performance and emphasized benefits of the experience for PST learning. Additionally, a common theme in previous studies revealed PSTs' weaknesses especially in the way they asked questions and responded to student thinking. Considering the importance of reflection in the context of teacher learning and transforming of actions, there is a need for studies which focus on the nature of PSTs' reflections in the context of conducting clinical interviews and not only their performance.

Reflection Skills of Prospective Teachers

Developing reflection skills has been considered one of the most important goals of teacher education (Korkko, Kyro – Ämmälä, & Turunen, 2016; Olteanu, 2016; Schon, 1983). According to Dewey (1933), reflection is "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and further conclusions to which it tends." (p. 9) Reflection is considered a core practice in teacher education programs which help prospective teachers structure their experiences, making sense of their experiences and learning from them. It is expected that by way of reflection prospective teachers observe and filter their experiences, thoughts and beliefs and develop their own personal understandings about teaching profession which may transform their identity as a future teacher (Korkko et al., 2016). Schon (1983) has introduced two levels of reflection in line with Dewey's conceptualization of reflection: reflection-in-action and reflection-on-action. *Reflection-in-action* refers to one's reflection during an action, and *reflection-on-action* refers to reflection after an action. This classification was further developed by Killion & Todnem (1991) who added *reflection-for-action* which involves anticipation of what will occur next, planning, and making decisions for future actions. According to Killion and Todnem (1991), engaging in reflection-on-action and reflection-for-action allows the teachers analyze events related to teaching and learning and develop insights into future practices (Killion & Todnem, 1991). Farrell (2013) found that experience and thinking about past actions enabled teachers' skills of reflection-for-action which played an important role in teachers' decision-making process. Similarly, Olteanu (2017) documented that reflection-for-action was difficult for teachers but also proved a beneficial teacher practice for student learning and improving the quality of a mathematics lesson. The results of Olteanu (2017) suggested that reflection-for-action occurred when teachers focused on different representations and considered different examples.

The development of prospective teachers' reflective skills has been researched extensively (Davis, 2006; Gelfuso & Dennis, 2014; Korkko et al., 2016) and the focus was mostly on the aspect of reflection-on-action. In general, previous studies documented how challenging it was to reflect productively for many prospective teachers (Gelfuso & Dennis, 2014; Korkko et al., 2016). The productive reflections (Davis, 2006) refer to narratives where prospective teachers use evidence for arguments and make connections between theory and practice and steer away from evaluative and judgmental language. The productive reflections are not just descriptive but has the prospective teacher pay attention to most significant aspects of the experience and learn lessons for future actions.

The context for reflection in previous studies is mostly during student-teaching or practicum courses (Davis, 2006; Korkko et al., 2016; Turunen & Tuovila, 2012) or in clinical experiences utilizing video cases (Santagata & Angelici, 2010; Star & Strickland, 2008; Stockero, 2008). A frequently used framework in order to analyze teachers' professional noticing skills through reflections on video observations was developed by van Es (2011) who identified different levels associated with PSTs' ways of focusing on student thinking and mathematics. Lower levels in the framework indicated description of what happened or using evaluative language, while higher levels indicated making connections, developing arguments on details of student understanding, providing evidence for claims and consideration of alternative pedagogical decisions.

Although watching other teachers and reflecting on their teaching has benefits and frequently utilized in teacher education (Star & Strickland, 2008), reflecting on one's own experience and developing insights in own practice may be more motivational for teachers and lead to more substantial reflections about teaching and learning (Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011). A review of studies suggests that there is a need for studies, which investigate prospective teacher reflection skills in a variety contexts in order to understand how to help them develop such skills before the practicum. It is important to understand nature and types of reflection associated with different types of

experiences which have a potential to help prospective teachers improve their professional vision and pedagogical content knowledge as well as transform unproductive beliefs as future professionals (Meschede et al., 2017). In this study, reflecting on one's own video in a clinical interview setting is intended to isolate external factors such as classroom management and contextual issues and help prospective teacher focus on student understanding and their own question and responses during the interaction as future teachers.

Methodology

This study was conducted in the context of a teacher education course named "Use of video for teacher learning" which was taught by the researcher in a mathematics teacher education program in a large city in Turkey. This methodology of this study is self-study (Loughran, 2007) since it investigated the researcher/teacher educator's and the prospective teachers' experiences. The method of sampling is convenient sampling.

The Context of the Study, Participants, and Data Collection

An elective course which utilized benefits of video viewing based on previous research in teacher education literature was designed by the teacher educator and researcher of this study. The participants of the study were 16 pre-service middle school mathematics teachers enrolled in the elective course and submitted the final project. The PSTs were in their 1st or 2nd year in a 4-year teacher education program. In order to maintain confidentiality and anonymity, the participant names were replaced with pseudonyms throughout the paper.

The course was designed such that PSTs had opportunities to expand their professional vision and develop pedagogical content knowledge by a variety of resources and activities, focusing on the use of video. The course was also designed in line with the Flipped Classroom pedagogy (Taylan, 2017) which indicated in many sessions PSTs watched videos of teaching and learning before class and discussed the video clips and readings with their peers and the instructor during the class time.

The course content was divided into three periods. The first period focused on different video clips of whole class instruction of mathematics teaching. The video cases were intended to induce inquiry among PSTs as they could not be categorized problematic or exemplary at the first glance. Watching the video lessons, examining lesson plans and transcripts of the lessons and reflecting on what PSTs noticed individually and also with their peers were intended to create a shared professional language. By introducing the Lesson Analysis framework (Santagata & Angelici, 2010), the instructor encouraged backing up claims related to teaching and learning, encouraged to focus to student learning in connection with teaching practices and providing alternative pedagogical suggestions to the strategies viewed in the video lesson. The researcher aimed to shift the discussion from teacher to teaching (Stigler & Hiebert, 2009) and encourage discussion on possible lesson goals of each lesson as well as whether lesson goals were achieved considering teacher actions and student learning. The goal in watching whole class lessons were to help PSTs understand that the difficulty of focusing on student thinking in the midst of teaching and complexity involved in responding to students' needs.

The second part of the course focused on understanding student thinking via watching well-conducted or problematic clinical interview videos. PSTs learned purpose and methods of clinical interviews. In well-conducted interviews, interviewers were able to pose meaningful questions to the students, respond according to student thinking without evaluating their answers or directing their thinking. In problematic interviews the interviewer did not probe for student thinking, only asked yes-no questions or directed student thinking. The PSTs were instructed to focus on the interviewer questions and also what could be gained from the clinical interviews in terms of student strengths or weaknesses in their understanding of a concept.

During this phase of the course, the PSTs considered student strategies as viewed in the videos. PSTs were also encouraged to focus on strengths and weaknesses in student understanding and consider how they would respond to the student answer or questions. These prompts were intended to help prospective teachers mainly become ready to conducting their own clinical interviews and more specifically promoting developing better arguments about student understanding and preparing them for interacting with students in more meaningful ways.

The last part of the course was intended to have PSTs design or select and plan appropriate tasks for a clinical interview session, get feedback from the instructor and peers and conduct their own clinical interviews with a student. PSTs were also encouraged to do a simulation of their interviews with their peers in one class session before they presented their tasks to their interviewees. The final project of the course was conducting and videotaping their own clinical interview. Their final paper included the transcription of "significant moments" during the interview and reflecting on student understanding as well as their own performance as an interviewer. More specifically, the PSTs were asked to write a report on strength and weaknesses of student understanding of a concept, reflect on their own performance and decide what they could do alternatively in future interviews in order to better understand and respond to student thinking. The course assignments also included PSTs feedback to their peers.

The data sources for this manuscript were the final project papers of the PSTs and their videotaped clinical interviews. The papers included clinical interview tasks, description and images of significant moments of the interview and a

reflection on the interview. The tasks were chosen or developed by preferences of the participants and according to the level of the students they worked with. The reflection prompts required PSTs to consider strengths and weaknesses in student understanding of a mathematical concept and offer alternative ways of interacting with the student considering lessons learned from the experience in addition to an overall reflection on the experience.

Analyzing of Data

The transcripts of the interviews and reflections were analyzed based on apriori frameworks by Schon (1983), Killion & Todnem (1991) and van Es (2011). The reflection process in this study is summarized in Figure 1: 1. PSTs planned, designed and prepared clinical interviews, 2. PST reflection-in-action was about PSTs' reflections during the interview, 3. PSTs reflected on the experience of conducting the clinical interview, focusing on the strengths and weaknesses in student understanding and their performance as an interviewer, 4. PSTs reflected for alternative decisions in future interviews and what they would change in order to conduct better clinical interviews. The reflection process involved the experience of clinical interviews and how their experiences would help PSTs transform their beliefs, actions and thoughts about interacting with students.

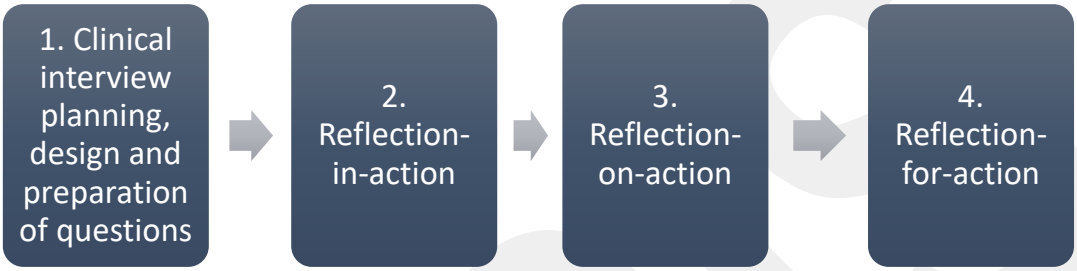

Figure 1. Preparation and reflection process associated with conducting clinical interviews in this study.

In order to answer the research question, the data analysis focused on steps 3 and 4: reflection-on-action and reflection-for action aspects of the reflection process. The researcher adapted previously used reflection frameworks and developed an analytical tool in order to assess the quality of reflection-on-action and reflection-for-action by utilizing previously used frameworks (Table 1). All transcripts, which were final project papers were coded by two coders who agreed on the coding process. The papers were coded for two dimensions (reflection-on-action and reflection-for-action) and scored according to the framework.

Table 1. Coding Framework for Analyzing PST Reflections on Conducting Clinical Interviews adapted from Schon (1983), Killion & Todnem (1991) and van Es (2011).

Reflection Types	Basic	Intermediate	Advanced
Reflection-on-action	Describes what happened during the interview.	Describes what happened during the interview and specifically focuses on details of student understanding in terms of their weaknesses and strengths in a given topic.	In addition to providing details of student understanding, makes at least several meaningful claims on student understanding consistent with the interview and theories of teaching and learning and provides evidence for the arguments she/he makes.
Reflection-for-action	Interviewer does not mention how he could improve the interview for the next time. There is judgment on the performance and student but no decision or planning in how to make it better.	There is some consideration of how to conduct the clinical interview next time. However, the consideration is too general and/or not in line with the interview. The PST makes a general comment skips a specific future action.	The interviewer considers how the interview went and offers concrete ideas/steps he can implement in the future in order to have a better experience the next time. The examples are in line with what happened during the interview.

Table 2. Coding Example Excerpts of PST Reflections on Conducting Clinical Interviews

Reflection Types	Basic	Intermediate	Advanced
Reflection-on-action	When the reflection only contained descriptive events. All PSTs had some type of interpretation Therefore, none of the papers were coded as basic. If a paper only consisted of statements about what students did rather than interpretation of what, they did, then it could be considered basic.	"The student can show fractions by drawing pictures but he has difficulties in comparing fractions. When comparing fractions, his shapes were not equal" (Nile)	"The student had some difficulties about showing the fractions on the number line (0:24-0:56 in the video clip). She did not divide the distance between 0 and 1 in equal pieces in the second question (8:55-12:26) which shows she did not understand the concept of unit in fractions." (Sheila)
Reflection-for-action	"I could ask more helpful questions" (Daisy) Analysis: In this case the PST does not explain what she means by "helpful" questions. This code did not include any mention of how the PST would conduct the interview differently even thought they were prompted to do so in the clinical interview protocol.	"He kept repeating the same answer. Maybe I could have asked in a different way by using the number line." (Nelly) Analysis: In this case the PST does not explain how she could ask the question differently by use of number lines. It is not specific enough to be a helpful reflection that could guide action for the next time.	"If I conduct the same interview again, I would ask 'how did you decide that the number is an even number' instead of only asking 'Is this an even number?'"(Fiona) Analysis: There is consideration of a concrete act, in this case, a question to guide a possible future interview.

Apart from reflection-on-action and reflection-for-action frameworks, reflection papers were also read and coded into different themes (Cohen, Manion & Morrison, 2011), which summarized PST's learning from the experience of conducting clinical interviews within this course.

Results

Reflection-on-action and Reflection-for-action

Results of coding according to Table 1 revealed that PSTs had more difficulties in providing high quality reflection-for-action. Table 3 indicates number of PSTs whose reflections were coded according to Table 1. According to Table 3, while only 4 reflections were considered advanced type of reflection-for-action, 12 of them were considered advanced in the category of reflection-on-action. There were no papers coded as basic in terms of reflection-on-action because all papers included some details about student thinking. On the other hand, there were 4 papers that were considered as basic in the category of reflection-for-action. Reflection-for-action indicated that a professional planned to change their actions based on their reflections of past experiences in order to transform a similar future action. The results suggested that PSTs were better at reflecting on their experiences and providing evidence for their claims compared to planning for future specific actions or providing alternative decisions in order to conduct clinical interviews in better ways. A larger number of intermediate coded papers compared to advanced might indicate that PSTs had difficulties in planning for specific future actions on the basis of their performance.

Table 3. *Coding Results*

	Number of PSTs (Total=16)		
Reflection Types	Basic	Intermediate	Advanced
Reflection-on-action	0	4	12
Reflection-for-action	4	8	4

Apart from a-priori coding on reflection-on-action, the reflections were also read with an open mind. Thematic analyses revealed that PSTs seemed to build their own theories of teaching and learning as a result of this process. In general, PSTs considered this experience as beneficial in terms of assessing both students' understanding and their ways of interacting with students. They also gave feedback that they would want to do this at least one more time in order to see progress in themselves in terms of questions they asked and the way responded to students during the interviews. Reading the reflections by using open codes led to several themes important in forming teacher identity: *Conducting clinical interviews as part of a teacher identity*, *complexity of conducting a clinical interview*, *personal theories about students*.

Conducting Clinical Interviews as Part of a Teacher Identity

A common theme across reflections was that PSTs did not view this experience as only a classroom assignment but considered it necessary as part of their future careers as teachers. One of the PSTs gave details about how he wanted to use clinical interviews in his teaching:

"I am sure I need to do this several times when I teach. I want to make interviews with different students about the same task. I will use the results in my teaching" (Mason)

Even though this particular PST did not report how he would use the results in teaching, he developed an understanding that he could use same task interacting with different students as a teacher in order to learn about student understanding which would inform his teaching.

Similarly, another student commented: "I would like to integrate clinical interview in my practices as a teacher. It would be more useful to interview students compared to examinations." (John). Although the student did not consider pros and cons of each method of assessment, she seemed to understand that conducting clinical interviews provide us a more detailed picture of student understanding compared to examinations. Another PST also mentioned she would want to conduct this many times in her teaching experience: "I am going to need to do this many times when I teach…By watching the videotapes of clinical interviews, we can see progress in both ourselves and students." (Abby) The statements like these indicate that prospective teachers may have developed an appreciation of conducting clinical interviews as not only a way to gauge student understanding but also as a way to measure their own progress as a teacher in terms of the way they interact with students.

Complexity of Conducting a Clinical Interview

Most PSTs revealed how difficult it was for them to conduct the interview especially due to the unpredictable nature of interactions. Similar to the dynamic nature of classroom, PSTs did not know what exactly students would say. This made PSTs realize difficulties of noticing student thinking, interpreting it and responding to it during the moment of instruction. The following excerpts share similarities in revealing PSTs' difficulties in adjusting performance according to the interviewees:

"I realized it was not so easy to make the interview go as planned." (Danny)

"I realized later she drew the wrong graph. I did not correct her because I did not notice it at the time of the interview. If I caught the mistake, maybe I could ask her different questions." (Ellis)

"A teacher should create new questions according to the student answer and should be prepared for all answers." (Bill)

"I needed time to respond well during the interview" (Abby)

Although most of these statements appear to be judgmental and evaluative of PSTs' own performance, being aware of complexities involved in interacting with students in the context of clinical interviews may help PSTs improve their performance.

Personal Theories about Students

It was common for PSTs to reveal their noticings about how students learned and assessment of student understanding. Several of their personal theories included the following statements:

"I came to understand they (students) can solve the questions in different ways than I thought they would" (Mary)

"I noticed a middle school student can do everything to only get to the right answer" (Nelly) "I noticed they can forget their knowledge from past very easily" (Nelly)

"I was surprised to see the student may know the procedure very well but it does not mean she can apply it in the question" (Fiona)

The above statements are examples that illustrate PSTs were naïve in their consideration of students. For instance, the PSTs expected students would remember previous knowledge, solve questions in only particular ways or be able to apply their existing knowledge in the right ways. The clinical interviews seemed to help the PSTs in constructing new understandings about students and improve their future actions as they interact with students.

Discussion and Conclusion

This paper investigated constructs of reflection-on-action and reflection-for-action associated with PSTs' experience of conducting clinical interviews. Results suggested that nature of advanced reflection-for-action was difficult to observe among the reports. On the other hand, PSTs were able to reflect on the experience in rather advanced ways, by focusing on strengths and weaknesses in student understanding, providing evidence to their claims and making sense of their observations. The difference in writing two types of reflection shows that the PSTs in this study may need more support in engaging in reflection-for-action which required thorough consideration of planning and transforming actions. This could be due to lack of experience in conducting clinical interviews and conducting it only for one time during the semester. Future studies need to investigate how PST reflection process would look like after several iterations of conducting the same clinical interview with different students. Perhaps, if there were other clinical interview assignments throughout the course, the PSTs could have given more detailed answers on how they would change the interview, which was related to the construct of reflection-for-action. Reflection-for-action could be considered difficult especially for PSTs since they have limited experience and knowledge about working with students and responding to their understanding in a simultaneous way. This is consistent with results of Olteanu (2017) who documented teachers had difficulties in engaging in reflection-for-action.

Similar to what was found in previous studies (Moyer & Moschiwtz, 2002; Schorr, 2001), PSTs found the experience very beneficial to their professional learning. Conducting clinical interviews and the reflection process seemed to help PSTs develop their own theories of teaching and learning. PSTs were able to consider pedagogical implications of the clinical interview experience. In other words, the PSTs considered their role as an interviewer and how this experience would help them as future teachers. One of the most salient patterns was the difficulty of responding to students in a way consistent with their understanding and their goals as teachers.

One of the results that could be an extension to the previous literature was how PSTs reported they would want to conduct clinical interviews with their students and that they believe this is a better way of assessing their students. Previous studies indicated that experiences of conducting clinical interviews played a role on improving PSTs' knowledge of students and led to more productive beliefs about teaching and learning (Jenkins, 2010; Schorr, 2001). The findings of this study agree with and extend prior findings and indicates that PSTs' knowledge of assessment and their identity as a future teacher may also shift and improve as a result of this experience.

This study has several limitations. First of all, it investigates a group of prospective teachers in their 1st and 2nd year of teacher education in the context of a large city in Turkey. Future studies may consider experiences of prospective teachers at different levels and in different contexts. One limitation of the study was that the reflection skills of prospective teachers were analyzed in the context of a course, which focused on conducting interviews out of school context and not during field experience or practicum. Although one may argue that it is different from a class setting, interacting with students and understanding their thinking as well as responding to their questions demanded that PSTs paid attention to student understanding in a particular topic as well as the skills of questioning and responding to students, which are important for professional learning of PSTs.

It seemed that conducting clinical interviews for the first time was challenging for the PSTs even though they each had experiences in tutoring students. Future studies would benefit more by investigating the same experience in cycles, i.e. if the PSTs conducted several clinical interviews and received feedback about their reflections and the experience. Additionally, in order to understand nature of PST reflections associated with clinical interview experience, it would be helpful to investigate all processes associated with this experience instead of only focusing on reflection-on action and reflection for action, also including preparing for the clinical interview and planning as well as reflection-in-action.

References

Cengiz, N., Kline, K., & Grant, T. (2011). Extending students' mathematical thinking during whole-group discussions. *Journal of Mathematics Teacher Education, 15*(5), 1–20.

Crespo, S. & Nicol, C. (2003). Learning to investigate students' mathematical thinking: The role of student interviews, *Proceedings of PME-27*, Vol. 2, 261-267, Honolulu, U. S. A.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). London: Routledge.

Davis, E.A. (2006). Characterizing productive reflection among preservice elementary teachers: Seeing what matters. *Teaching and Teacher Education*, *22*, 281-301.

Farrell, T.S. (2013). Reflecting on ESL teacher expertise: A case study. *System*, *41* (4), 1070-1082.

Franke, M., Webb, N. M., Chan, A.G., Ing, M., Freund, D., & Battey, D. (2009). Teacher questioning to elicit students' mathematical thinking in elementary school classrooms. *Journal of Teacher Education*, *60* (4), 380-392.

Gelfuso, A., & Dennis, D. (2014). Getting reflection off the page: The challenges of developing support structures for pre-service teacher reflection. *Teaching and Teacher Education, 38*, 1-11.

Ginsburg, H. (1997). *Entering the child's mind: The clinical interview in psychological research and practice*. Cambridge: Cambridge University Press.

Ginsburg, H. P., Cami, A. E., & Preston, M. D. (2010). Inquiry practices: How can they be taught well? In N. Lyons (Ed.), *Handbook of reflection and reflective inquiry: Mapping a way of knowing for professional reflective inquiry* (pp. 453-472). New York: Springer.

Ginsburg, H. P., Jacobs, S. F., & Lopez, L. S. (1998). *The teacher's guide to flexible interviewing in the classroom: Learning what children know about math*. Boston, MA: Allyn and Bacon.

Goodwin, C. (1994). Professional vision. *American Anthropologist*, *96*(3), 606-633.

Jacobs, V. R. & Empson, S. B. (2016). Responding to children's mathematical thinking in the moment: an emerging framework of teaching moves. *ZDM Mathematics Education*, *48*, 185-197.

Jacobs, V. R., Lamb, L. L. C., Philipp, R. A., & Schappelle, B. P. (2011). Deciding how to respond on the basis of children's understandings. In M. G. Sherin, V. R., Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 97–116). New York: Routledge.

Jenkins, O. F. (2010). Developing teachers' knowledge of students as learners of mathematics through structured interviews. *Journal of Mathematics Teacher Education, 13*, 141-154.

Kagan, D. M. (1992). Professional growth among pre-service and beginning teachers.

Review of Educational Research, *62*(2), 129-169.

Killion, J., & Todnem, G. (1991). A process of personal theory building. *Educational Leadership*, *48*(6), 14– 17.

Korkko, M., Kyro - Ämmälä, O. & Turunen, T. (2016). Professional development through reflection in teacher education. *Teaching and Teacher Education, 55*, 198 - 206.

Loughran, J. (2007). Researching teacher education practices: Responding to challenges, demands and expectations of self-study. *Journal of Teacher Education*, *58* (1), 12-20.

Moyer, P.S. & Milewicz, E. (2002). Learning to question: Categories of questioning used by preservice teachers during diagnostic mathematics interviews. *Journal of Mathematics Teacher Education*, *5* (4), 293-315.

Mewborn, D.S. & Huberty, P.D. (1999). Questioning your way to the standards. *Teaching Children Mathematics*, *6*(4), 226–227, 243–246.

Meschede, N., Fiebranz, A., Moller, K., & Steffensky, M. (2017). Teachers' professional vision, pedagogical content knowledge and beliefs: On its relation and differences between pre-service and in-service teachers. *Teaching and Teacher Education*, *66*, 158-170.

Olteanu, C. (2016). Reflection and the object of learning. *International Journal for Lesson and Learning Studies*, *5*(1), 60–75.

Olteanu, C. (2017). Reflection-for-action and the choice or design of examples in the teaching of mathematics. *Mathematics Education Research Journal*, *29*, 349-367.

Reinhold, S. (2016). Uncovering facets of interpreting in diagnostic strategies pre-service teachers use in one-on-one interviews with first-graders. In Konrad Krainer; Nadˇa Vondrova´ (Eds.), *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education* (pp. 2895-2901). Prague, Czech Republic.

Sahin, A., & Kulm, G. (2008). Sixth grade mathematics teachers' intentions and use of probing, guiding, and factual questions. *Journal of Mathematics Teacher Education*, *11*(3), 221-242.

Santagata, R., & Angelici, G. (2010). Studying the impact of the lesson analysis framework on preservice teachers' abilities to reflect on videos of classroom teaching. *Journal of Teacher Education*, *61*(4), 339-349.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books, Inc.

Schorr, R. Y. (2001). A study of the use of clinical interviewing with prospective teachers. In M. van den Heuvel-Panhuizen (Ed.), *Proceedings of the 25th conference of the international group for the psychology of mathematics education* (Vol. 4, pp. 153–160). Utrecht, The Netherlands: Freudenthal Institute.

Schorr, R.Y., & Ginsburg, H.P. (2000). Using clinical interviews to promote pre - service teachers' understanding of children's mathematical thinking. *Proceedings of the 22nd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Tucson, Arizona, USA.

Seidel, T., Stürmer, K., Blomberg, G., Kobarg, M., & Schwindt, K. (2011). Teacher learn- ing from analysis of videotaped classroom situations: Does it make a difference whether teachers observe their own teaching or that of others? *Teaching and Teacher Education, 27*(2), 259–267.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4–14.

Star, J. & Strickland, S. (2008). Learning to observe: Using video to improve pre-service mathematics teachers' ability to notice. *Journal of Mathematics Teacher Education, 11*(2), 107 – 125.

Stein, M. K, Engle, R. A., Smith, M.S., & Hughes, E. K. (2008). Orchestrating productive mathematical discussions: Five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning, 10*(4), 313–340.

Stigler, J. W., & Hiebert, J. (2009). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom*. New York: Simon and Schuster.

Stockero, S. L. (2008). Using a video-based curriculum to develop a reflective stance in prospective mathematics teachers. *Journal of Mathematics Teacher Education, 11,* 373-394.

Taylan, R. D. (2017). Promoting active learning in mathematics teacher education: The flipped classroom method and use of video content. In J. Keengwe & P. Bull (Eds.), *Handbook of Research on Transformative Digital Content and Learning Technologies*, 269-284. Hershey, PA: IGI Global.

Turunen, T.A., & Tuovila, S. (2012). Mind the gap. Combining theory and practice in a field experience. *Teaching Education*, *23* (2), 195-198.

van Es, E. (2011). A framework for learning to notice student thinking. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 134–151). New York: Routledge.

Weiland, I., Hudson, R., & Amador, J. (2014). Preservice formative assessment interviews: The development of competent questioning. *International Journal of Science and Mathematics Education*, *12*, 329–352.