

PRE-SERVICE MATH TEACHERS' PROFESSIONAL IDENTITY
DEVELOPMENT THROUGH ONLINE ANTICIPATORY REFLECTIONS: AN
INTERVENTION STUDY

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AMİNE MERVE ERCAN

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**PRE-SERVICE MATH TEACHERS' PROFESSIONAL IDENTITY
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AN INTERVENTION STUDY**

submitted by **AMINE MERVE ERCAN** in partial fulfillment of the requirements for the degree of **Master of Science in Educational Sciences, Curriculum and Instruction, the Graduate School of Social Sciences of Middle East Technical University** by,

Prof. Dr. Yaşar KONDAKÇI
Dean
Graduate School of Social Sciences

Prof. Dr. Cennet ENGİN DEMİR
Head of Department
Department of Educational Sciences

Assist. Prof. Dr. Nur AKKUŞ ÇAKIR
Supervisor
Department of Educational Sciences

Prof. Dr. Ali YILDIRIM
Co-Supervisor
Gothenburg University
Department of Educational Sciences

Examining Committee Members:

Assoc. Prof. Dr. Yeşim ÇAPA AYDIN (Head of the Examining Committee)
Middle East Technical University
Department of Educational Sciences

Assist. Prof. Dr. Nur AKKUŞ ÇAKIR
Supervisor
Department of Educational Sciences

Assoc. Prof. Dr. Sedef CANBAZOĞLU BİLİCİ
Aksaray University
Mathematics and Science Education

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name: Amine Merve ERCAN

Signature:

ABSTRACT

PRE-SERVICE MATH TEACHERS' PROFESSIONAL IDENTITY DEVELOPMENT THROUGH ONLINE ANTICIPATORY REFLECTIONS: AN INTERVENTION STUDY

ERCAN, Amine Merve

M.S., The Department of Educational Sciences, Curriculum and Instruction

Supervisor: Assist. Prof. Dr. Nur AKKUŞ ÇAKIR

Co-supervisor: Prof. Dr. Ali YILDIRIM

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This was an intervention study aimed to gain insight into the development of teacher identity during pre-service education by online anticipatory reflections. With this aim, the following research questions were examined; (1) How do pre-service math teachers perceive their professional identity? (2) What effect do weekly online anticipatory reflections have on pre-service teachers' professional identity development? (3) How does reflecting online on "professional self" impact pre-service math teachers' professional identity development?

The study adopted Beijaard et al. (2000)' s teacher identity framework and was designed as a mixed-method study. A single group of the pre-test-post-test design was used for the quantitative strand of the research while a thematic analysis approach was adopted for the qualitative strand. Convenient sampling method was used. The quantitative data were gathered from 31 pre-service elementary Math teachers whereas the qualitative data were from seven volunteer pre-service teacher who attended the intervention. Data was collected through Early Teacher Identity Measurement and

semi-structured interviews. The quantitative data were analyzed by the SPSS24.0 statistical package program and the qualitative data by thematic analysis approach.

The results indicated that pre-service teachers focus more on pedagogical and didactical expertise while defining themselves as a teacher and there was a significant positive difference in the identity development of the pre-service teachers according to the ETIM at the end of the 10-week intervention. Also, according to the pre-service teachers, the intervention facilitated their thinking skills, awareness, internalization of their profession and provided them with new perspectives, therefore facilitated their professional identity development.

Keywords: Pre-service teacher identity, reflective writing, anticipatory reflection, math teacher identity

ÖZ

HİZMET ÖNCESİ MATEMATİK ÖĞRETMENLERİNİN ÇEVİRİMİÇİ GELECEĞE DÖNÜK YANSITICI YAZILAR YOLUYLA PROFESYONEL KİMLİK GELİŞİMİ: BİR MÜDAHALE ÇALIŞMASI

ERCAN, Amine Merve

Yüksek Lisans, Eğitim Bilimleri, Eğitim Programları ve Öğretim Bölümü

Tez Yöneticisi: Assist. Prof. Dr. Nur AKKUŞ ÇAKIR

Ortak Tez Yöneticisi: Prof. Dr. Ali YILDIRIM

Ekim 2020, 149 sayfa

Bu çalışma, çevrimiçi geleceğe dönük yansıma yazılarıyla hizmet öncesi öğretmen eğitimi sırasında meydana gelen öğretmen kimliğinin gelişimine ilişkin bilgi edinmeyi amaçlayan bir müdahale çalışmasıdır. Bu amaçla aşağıdaki araştırma soruları incelenmiştir; (1) Matematik öğretmen adayları mesleki kimliklerini nasıl algırlarlar? (2) Haftalık çevrimiçi geleceğe dönük düşüncelerin öğretmen adaylarının mesleki kimlik gelişimi üzerinde nasıl bir etkisi vardır? Ve (3) Çevrimiçi “profesyonel benlik” üzerine düşünmek, matematik öğretmen adaylarının mesleki kimlik gelişimini nasıl etkiler?

Çalışma, Beijaard ve ark. (2000) 'nın öğretmen kimliği teorisini kuramsal çerçeve olarak temel almıştır ve haftalık çevrimiçi ileriye dönük yansıtıcı yazmanın matematik öğretmeni adaylarının mesleki kimlik gelişimine etkisini araştırmak için karma yöntem kullanılmıştır. Araştırmanın nicel kısmı için tek bir gruplu ön test-son test deseni kullanılırken, nitel kısmı için tematik analiz yaklaşımı benimsenmiştir.

Bu çalışmada bir rastlantısal olmayan örnekleme yöntemi olarak kolayda örnekleme yöntemi kullanılmıştır. Araştırmanın nicel verileri, 31 üçüncü sınıf

matematik öğretmen adayından, nitel veriler ise müdahaleye katılan yedi gönüllü öğretmen adayından toplanmıştır. Veriler, ETİM ve yarı yapılandırılmış görüşmeler yoluyla toplanmış, nicel veriler SPSS24.0 istatistik paket programı kullanılarak analiz edilirken ve nitel veriler tematik analiz yaklaşımı ile analiz edilmiştir.

Sonuçlar, öğretmen adaylarının kendilerini öğretmen olarak tanımlanırken mesleki kimliklerinin pedagojik ve didaktik uzmanlığına daha çok odaklandıklarını ve 10 hafta sonunda, öğretmen adaylarının ETİM'e göre kimlik gelişiminde anlamlı bir pozitif fark olduğunu göstermiştir. Ayrıca öğretmen adaylarına göre bu müdahale çalışması onların düşünme becerilerini geliştirmiş, farkındalıklarını artırmış, öğretmen kimliğini içselleştirmelerini kolaylaştırmış ve onlara yeni bakış açıları kazandırmış, dolayısıyla mesleki kimliklerini geliştirmelerine olanak sağlamıştır.

Anahtar Kelimeler: Öğretmen adayı kimliği, yansıtıcı yazma, geleceğe dönük yansıtıcı yazı, matematik öğretmeni kimliği

Dedicated to my dear sister, mom, dad and darling...

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LIST OF ABBREVIATIONS

ETIM: Early Teacher Identity Measure

METU: Middle East Technical University

ITMDC: Instructional Technology and Material Development Course

CHAPTER 1

INTRODUCTION

1.1. Background of the Study

Teacher education programs aim to supply pre-service teachers with necessary knowledge and skills required for being a successful teacher in the classroom and aim to educate them about how to teach, how to learn, how to manage a classroom, foundations of education and curriculum, how to prepare lesson plan and activities. At the end of a teacher education program, pre-service teachers are expected to make a healthy bond between the theory and practice. Nevertheless, the transfer of theories into real life usually causes a sense of ineffectiveness and defeat. Thus, the transition from teacher education to teaching is so crucial and the development of professional identity is the main factor of this transition (Beauchamp & Thomas, 2009).

Some researchers did not distinguish teachers' professional identity from identity in general (Gu, 2011). Most of the researchers did not even provide a clear description of the term of teacher identity in their research (Hu, Xiao, Xiang, Bai & Zhang, 2017). Although there is not existing a common definition for it (Izadina, 2013; Beijaard et al., 2004), its concept has been widely considered in education literature (Beijaard et al., 2004) and for a teacher, teacher professional identity is correlated with the professional status of the teacher (Gee, 2001) and its importance is accepted to be precise for the teaching profession (Izadina, 2013).

Walkington (2005), handled teacher identity as a construction of the beliefs about teaching and being a teacher. Flores and Day (2006) defined it as "an ongoing and dynamic process which entails the making sense and (re)interpretation of one's values and experiences" (p. 220). It is a process of becoming aware of the questions like 'who am I as a teacher?' and/or 'who do I want to become?' (Kelchtermans & Hamilton, 2004; Korthagen & Vasalos, 2005). Olsen (2012) says that it is not only a

dynamic process but also a product that can be differentiated from a teacher's "role" but cannot be discussed separately from a teacher's "self". Similarly, Sun (2012) noted that teachers' professional identity is rooted in teachers' notions or thoughts of self. Gee (2000-2001) defined it as a component of multiple identities (individual, core, and social) while Beijaard et al. (2000) argue that these multiple identities should be merged in various and heterogeneous ways to define what really identity is.

Gresalfi and Cobb, (2011) draw attention to the discipline of a teacher to understand a teacher's professional identity and highlight the importance of discipline-based identity. Discipline-based identity is specifically vital for mathematics teachers and is associated with the work of teaching mathematics (Li, 2016). As the concept of mathematics teacher identity is not clearly defined in the literature, researchers generally tried to define it by looking at the components of teacher identity such as beliefs, knowledge, and emotions related to the mathematics (e.g., Kasten, Austin, & Jackson, 2014; van Putten, Stols, & Howie, 2014; Skog & Andersson, 2015; Van Zoest & Bohl, 2005) or by focusing on expertise in a specific subcategory such as subject matter expertise, didactical expertise, pedagogical expertise necessary to be a good teacher (Akkoc & Dede 2016). Subject matter knowledge refers to a mathematics teacher's capability of explaining the reasoning behind math topics and understanding of misconceptions, didactical knowledge refers to a mathematics teacher's organization ability of topic in line with students' capability of mathematics and pedagogical knowledge refers to the ability of teaching, communication and classroom management skills (Beijaard et al., 2004).

Teacher identity development is an ongoing process and defined to have three sequential phases: Before pre-service, pre-service, and in-service (Olsen, 2008). The first stage of this process covers the occurrences that happen before pre-service education in a teacher's life. This stage includes the reasons for choosing teaching as a profession, while the second stage indicates teacher education before a professional career and the third one points out professional career history (Olsen, 2017). According to Flores and Day (2006), the third step is the most effective step for the development of professional identity, and they call the previous steps as pre-teaching identity. On the other hand, Izadinia (2013) argues that the second stage should be

considered as the first and most effective step of teachers' professional identity development. The literature points out that teacher education programs impact pre-service teachers' sense of efficacy and contribute to the development of a professional teacher identity (Ottesen, 2007; Rots, Aelterman, Vlerick, & Katrien, 2007) and that pre-service teacher education stage is critical for professional identity development (Aslan, 2018).

During the pre-teaching identity phase; observing teaching and gaining some teaching experience, getting feedback from a mentor, and identifying her/himself as a teacher are important factors which affect the enrichment of the identity development (Anspal, Eisenschmidt, & Löfström, 2012; Beijaard et al., 2004; Celikdemir, 2018). According to Akkerman and Meijer (2011), teacher education works as a catalyst between being a student and being a teacher. Britzman (1988) said that pre-service teacher academies "provide the theories, methods, and skills; schools provide the classroom, curriculum, and students; and student-teacher provides the individual effort; all of which combine to produce the finished product of professional teacher" (p. 442).

However, Russell, McPherson, and Martin (2001) argued that novice teachers are not always effective in the classroom and highlighted the presence of a disconnect between theory and practice as a reason for this deficiency. When a novice teaching experience teaching in the classroom for the first time, his/her first actions as a teacher may sometimes conflict with his/her perceptions of prior educational life both at university and in K-12 school contexts but evolving from a pre-service teacher to a professional might provide a deeper insight about professional identity and about how to handle these conflicts in the future (Lerseth, 2013).

Research points out that an effective identity formation process can lead to high-level job satisfaction and an increase in the level of motivation, self-efficacy, and professional engagement (Canrinus, Helms-Lorenz, Beijaard, Buitink, & Hofman, 2011) and teachers' identity is reported to be fundamental for commitment to the occupation (Cohen, 2010; Burn, 2007; Day, Elliot, & Kington, 2005; Hofman, 1988; Gaziel, 1995; Schepens, Aelterman, & Vlerick, 2009; Thomas, 2003). Therefore, developing intentional and organized pedagogy systems to strengthen pre-service

teachers' professional identities throughout teacher education programs is of paramount importance (Zembylas & Chubbuck, 2015).

Studies including interventions to support teacher identity development have mostly focused on pre-service teachers' reflective practices and how these practices affect their professional identity formation (Alsup, 2006; Burn, 2007; Marcos, et al., 2008). The number of studies focusing on teacher reflections has increased in the field of teacher education over the past decades (Yuan & Mak, 2018) as focusing on teachers' written and verbal reflections in terms of their past, present and future narratives contribute to self-awareness and teachers can recognize and consider their goals and beliefs regarding their role as future teachers (Flores, 2014; Leijen et al., 2014). Such guidance systems support teachers to understand their instant (actual) and future (designed) position of identities (Sfard & Prusak, 2005). Therefore, supervised reflection activities are recommended during teacher education programs (Leijen et al., 2014).

Furthermore, when pre-service teachers cannot have enough chances to gain insight about themselves through experience, reflective writing may help them since the opportunity of reflecting upon their assumptions about learning is another element which builds up professional identity (Merseth, Sommer, & Dickstein, 2008).

As a word, reflection is derived from the Latin verb "reflectere", a combination of bend or turn ("lecture") and backwards or back ("re") (Bengtsson, 2003). Reflection is believed to be something that happens in action and defined both as an action to better understand the self and as a cognitive activity (Bengtsson, 2003; Van Manen, 1995). One of the researchers who also regarded reflection as a 'cognitive activity' was John Dewey (1964). According to Dewey (1964), 'thinking is the accurate and deliberate institution of connections between what is done and its consequences' (p. 505) and reflective thought 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 (Dewey, 1933, p. 9). He also suggested that reflective thinking help us to be aware of what we revolve around when we deal with difficulties of the profession, so it is essential both for teaching, and the aim of education (Dewey, 1964).

There are different types of reflection such as (1) retrospective reflection (past), (2) anticipatory reflection (future), (3) contemporaneous reflection (present) (Van Manen, 1995). Reflection generally is given through looking back but anticipatory reflection signifies looking forward in time (Conway, 2001). Van Manen (1995) identified anticipatory reflection as 'future-oriented reflection before action, and retrospective reflection' (p. 34). It provides a chance for people to learn from their past and present actions and to utilize these penetrations to future circumstances. When people engage in this reflective process regularly, they become more adept, taking advantage of experiences for future situations (Urzúa & Vásquez, 2008).

In the literature, some studies focus on teacher attrition in the first years of a teaching career (Ingersoll & Alsalam, 1997; Ingersoll & Smith, 2003; Lankford, Loeb & Wyckoff, 2002), of math teachers (Ingersoll, 2001). Following them, studies about the importance of pre-service education emerged (e.g. Alsup, 2006; Beauchamp & Thomas, 2009). Although there already were studies that emphasized the importance of pre-service teacher education (Dewey, 1933), the importance of pre-service teacher identity had become popular in the education literature in the late 20th century (Akkerman & Meijer, 2011). Although the professional identity of teachers is a subject that has been studied more in recent years throughout the world, there is still not enough work on teacher preparation programs (Lerseth, 2013) but when the studies focus on teacher identity development, it is seen that a remarkable amount of them drew on the positive effects of reflective writing both in Turkey context (e.g. Ekinici & Delen, 2016; Celikdemir, 2018; Durmaz & Yigitoglu, 2017; Koc & Yıldız, 2012; Koca, 2016; Yaylı, 2012) and out of Turkey context (e.g. Akkerman & Meijer, 2011; Alsup, 2006; Lerseth, 2013). Tutinis and Hacıfazıloğlu (2018) stated that teachers start their professional career with a low level of self-confidence and practices done about teacher identity positively facilitates their self-confidence and identity. According to the literature review study of Eymir (2018), 35 thesis and 19 articles on reflective writing in the context of teacher identity development demonstrated positive effects of reflective writing on teacher identity. Additionally, it was stated by the pre-service teachers that reflective writings have positive effects on their sense of responsibility, professional identity (Akkoyunlu, 2016).

1.2. Purpose of the Study

This study aimed to gain insight into the development of pre-service Mathematics teacher identity during pre-service education through online anticipatory reflections. More specifically the following research questions were investigated;

1. How do pre-service math teachers perceive their professional identity?
2. What effect do weekly online anticipatory reflections have on pre-service teachers' professional identity development?
3. What are pre-service teachers' perceptions about the weekly online anticipatory reflections?

1.3. Significance of the Study

Teachers' understanding of identity has a central position to understand their actions (Kelchtermans, 2005). Hence, a more comprehensive understanding of their own professional identities can aid teachers to defeat many of the difficulties in their professions (Titu, 2019).

Palmer (2006) strongly emphasized that a teacher cannot recognize his students until he identifies himself. He suggests that a strongly internalized sense of identity is a mutual property of all good teachers. "What makes someone a good teacher is not a methodology or even ideology. It requires engagement with identity, the way individuals conceive of themselves as if teaching is a state of being, not merely ways of acting or behaving" (Danielewicz, 2001, p.3). When a teacher knows the response of the question: "Who am I?", the teacher defines her/his attitudes, values, and beliefs about how a pupil learns (Dickinson, 2012). Answering this question helps to be a better teacher because it 'provides the framework for teachers in the construction of their ideas of "how to be" and "how to act" as a teacher' (Thomas & Beauchamp, 2007, p.178) and a strong identity lighten the way of a teacher to fight with the challenges, meet the expectations and overcome the complexities of the profession. Thus, the results of this study would be useful in terms of understanding how pre-service teacher form their professional identities.

Moreover, teachers are not neutral players in the classroom setting their sense of identity affects how teachers they view themselves and pupils as “learners” and “doers” of mathematics, and these viewpoints affect their experiences in the classroom (Walkington, 2005). This implies that identity is a piece of what forms a teacher and thus an essential aspect of professional development and correlatedly, the success of a teacher (McDougall, 2010) and his pupils (Dickinson, 2012). The results of the study would highlight the importance of the identity development process and its importance for student success.

If teachers cannot begin the profession with a strong sense of professional identity, they do not feel successful, satisfied, or rewarded with their profession and tend to leave teaching (Alsup, 2006). Also, teachers' identity is fundamental for commitment to the occupation (Cohen, 2010; Burn, 2007; Day, Elliot, & Kington, 2005; Thomas, 2003). In this sense, it is important to research how to support teacher identity development during teacher education.

The pre-service stage is the phase in which a teacher identity is built or developed, and self-reflection has an indisputable effect on the evolution of identity (Ryanti, 2017). During this time, pre-service teachers can form their identities by self-reflection because internalizing the profession is tied to telling and retelling the stories (Binks, Smith, Smith, & Joshi, 2009).

Studies are reporting positive effects of reflective writing on pre-service teacher identity development in the literature (Alsup, 2006; Arpacı-Somuncu, 2016; Djoub, 2018; Durmaz and Yiğitoğlu, 2017; Graham and Phelps, 2003; Koca, 2016; Tok, 2008; Yaşar, 2016; Yaylı, 2012). However, the literature also highlights the need for more intervention studies with reflective writing during the pre-service stage (Aslan, 2018; Alsup, 2006; Djoub, 2018; Graham and Phelps, 2003). There are limited studies that utilized a reflection as an intervention to support pre-service mathematics teachers' identity development in Turkey (e.g. Celikdemir, 2018). Therefore results of this study may contribute to the existing literature by proving the findings of an intervention designed to support pre-service math teacher identity and perceptions of these participant pre-service teachers about the effectiveness of the intervention. In terms of planning professional development programs in teacher education, the results

may help policymakers to better understand how a purposeful intervention may affect the development of pre-service teacher identities.

Furthermore, this study may offer a guide and/or example for other researchers to design reflective intervention programs to support pre-service mathematics teachers' identity development. By underlining the importance of effective practices of online reflective writing in teacher identity development, this study may offer some insight for teacher educators and teacher education programs into how to promote pre-service teachers' identity development (Izadinia, 2013; Lerseth, 2013; Olsen, 2008).

1.4. Definition of Terms

Identity: Some researchers utilize the term identity to mention to the culture or the ethnicity of a people while some handle identity to point out the community identification, some accept it as a component of the parts of a self or of multiple roles that persons attach in deeply differentiated modern society (Stets & Burke, 2000) and some define it as self-discrepancy under the control of culture (Tajfel & Turner, 2004).

Teacher identity: Teachers' professional identity is an ongoingly changing teacher's professional self-understanding which is created through the intersection of a teacher's characteristics and different sub-identities that the teacher is labelled in a different context (Beijaard, Meijer, & Verloop, 2004).

Professional identity: How a person determines themselves and desire to be known by others professionally (Lasky, 2005).

Mathematics teaching identity: How math teachers want to be recognized by others and define themselves concerning mathematics (Luehmann, 2007).

Preservice Teachers: The individuals enrolled in the three-semester teacher program and desire to be identified by self or others as a special kind of teacher (Luehmann, 2007, p. 827). The term 'preservice teachers' can be used correspondently with prospective teachers, beginning teachers, student teachers, novice teachers, teacher candidates, future teachers, or university students.

Anticipatory Reflection: 'future-oriented' reflections (Van Mannen, 1995) done for plans on future works (McAlpine & Weston, 2000; Tracey et al., 2014).

CHAPTER 2

LITERATURE REVIEW

In this chapter, a review of the literature about identity, teacher identity and preservice math teacher identity development, reflective writing, anticipatory reflective writing and related research studies in Turkey and all around the world are presented.

2.1. Identity

Identity is defined as an attribute which defines the political, social and cultural existence that makes an individual unique (Cevizci, 2010). Until the middle of the 20th century, as a terminology, identity was used in the field of psychoanalysis (Olsen, 2012). Later on, the term, identity, had become popular in other various disciplines (Beauchamp & Thomas, 2009), such as literature, philosophy, theology, art, neuroscience, and linguistics, and specifically, in the second half of the 20th century, in sociology and anthropology (Olsen, 2012). Therefore, in the literature, the studies about identity have been conducted for more than a century, and each field defined identity differently instead of using a common and compendious definition (Beauchamp & Thomas, 2009; Darragh, 2016; Vermunt, Vrikki, Warwick & Mercer, 2017). This multitude of identity definitions caused disagreements about framing identity; some boarded it according to ascribed or cultural status like race, gender, sexual orientation, nationality, ethnicity, social status or class, religious, language, ability and so on (Olsen, 2012) while others framed it through intrinsic senses of readiness to live such as Freud's inner identity (Ericson, 1956; Erikson, 1968).

Inner identity is a dynamic self-imagination process through which human creates a viewpoint about her/himself over time (Olsen, 2012). In another explanation, it is a "resource that people use to explain, justify and make sense of themselves concerning others, and to the world at large" (MacLure, 1993).

On the other hand, the term ‘cultural identity’ can be handled as the identity created through the ascribed status like cultural and ethnic or racial issues (Anderson, 1991) and some researchers use the term ‘socio-cultural identity’ to describe identity which is the product of an individual's social and cultural history (Olsen, 2012). Within the boards of socio-cultural identity view, identity is a dynamic notion and takes shape in line with the interaction with others (Riyanti, 2017; White, 2017).

Researchers assert that if we would like to describe someone’s identity, we cannot separate the labels of that person as cultural identity and inner identity; in other words, we cannot separate the set of qualifications that come from both intrinsic features and environmental factors (Kaya, 1997). Each label we have in this life (for example, being the dad of Andrey or being Turkish) is called as identity (Appiah, 2006). Thus, it can be concluded that identity is a multidimensional, complex structure defined “not only as our sense of self or that we are” (Reed, Forehand, Puntoni & Warlop, 2012, p.319) but also as the label we get through the interaction with society (Riyanti, 2017; White, 2017).

2.2. Teacher Identity

Studies demonstrated that approximately 45–50% of novice teachers eager to quit the profession within the first five years (Ingersoll & Smith, 2003). Additionally, studies concluded that beginning teachers who have high scores in the university entrance exam, who have recommended results in teaching certification exams (Lankford, Loeb & Wyckoff, 2002), who graduated from outstanding colleges (Lankford et al., 2002), and who has graduate degrees (Ingersoll & Alsalam, 1997) more tend to quit teaching compared to others. Among these qualified teachers, secondary math and science teachers have the highest number of attrition (Ingersoll, 2001). This high percentage of novice teacher attrition causes a new process of recruitment, hiring, induction and influx (Goldrick, Osta, Barlin, and Burn, 2012) and causes an interruption in professional development; therefore, causes the extra financial cost (Ballou & Podgursky, 1998) and negative effects on professional identity development. Thus, the concern of researchers and policymakers focuses on

the increasing rate of teacher walk off, particularly among new teachers (Ingersoll, 2001).

Considering the literature, this attrition of new teachers who have a strong background, is based on several reasons (Kardos & Johnson, 2007; Luekens, Lyter, Fox, & Chandler, 2004; Ingersoll, 2001; Weiss, 1999). Among them, one of the most effective reasons has been declared as developing weak/non-workable professional identity (Alsup, 2006; Britzman, 2003).

Since the end of 80s, professional identity has been in the central of the studies about teaching, teachers' ideas, life histories, emotions, and personal journals, and has highlighted the importance of being aware of professional teaching identity and external (political, historical and social) forces which reform it (Rodgers & Scott, 2008). Along with the increased number of identity studies in the late 20th century, it is safe to say that teacher identity had become a popular terminology in the education literature (Akkerman & Meijer, 2011).

Teacher identity is defined to be a type of identity, and professional development of teacher identity is defined as being aware of the questions like “who am I as a teacher?”, “whom do I want to become?” (Kelchtermans & Hamilton, 2004; Korthagen & Vasalos, 2005). Like identity, there is not any existing common definition for teacher identity either (Izadinia, 2013; Beijaard et al., 2004). Some researchers suggest that teacher professional identity is the cumulation of a teacher's beliefs about teaching, and being a teacher (Walkington, 2005) while others suggest that it can be defined through a teacher's professional status (Gee, 2001), social position (Olsen, 2008) or defined as a product of teacher's society, interactions with others and interpretations of a teacher's experiences (Gee, 2000; Geijsel & Meijers, 2005; Olsen, 2008; Slay & Smith, 2011; Sutherland, 2009). To sum up, teacher identity can shortly be described as “being recognized by self or others as a certain kind of teacher” (Luehmann, 2007, p. 827). A well-developed teacher identity depends on the pedagogical expertise, didactical expertise, and subject matter expertise of the teacher.

This kind of definition of identity underlines the importance of not only having a label as a teacher but also having a conceptual understanding of teaching and

possessing qualified teaching abilities for a well-constructed teacher identity (Beijaard et al., 2000).

Meijer, De Graaf and Meirink (2011) studied the early years of pre-service teachers professional experience, their interpretation of their development after teacher education process and their ideas about critical points in their development and reported that individuals' positive/negative experiences in professional life play a role in the development of their professional identity, and they have difficulty in making sense of their professional roles in cases of disappointment. The researchers highlighted that of this may be due to teachers unrealistic expectations about their personal development which is rarely a constantly rising line but includes many sudden increases/decreases. Therefore, it is important that pre-service teachers receive training based on their teaching identity from the very beginning of their teaching education so that they can understand the complexity caused by these ups and downs and be supported (Lerseth, 2013).

Professional identity is reported to have impacts on the productiveness, engagement to teaching, professional development, the capacity to track educational innovations, or eagerness to apply new ideas into teaching practice. Teachers' views on their professional identity also affect their professional development, as well as their adaptability and motivation to cope with the difficulties and implement educational innovations in their teaching practice (Beijaard, Verloop & Vermunt, 2000).

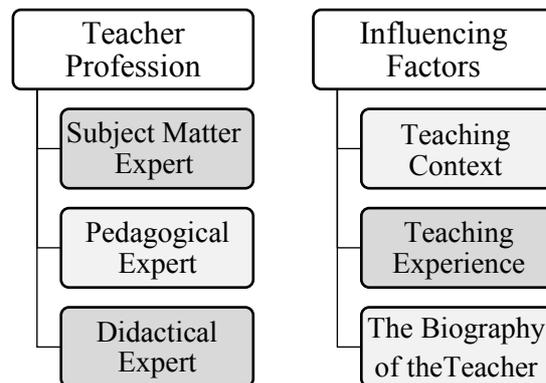
Besides, identity formation is explained as a dynamic, ongoing process which is informed, formed and reformed by the interactive relation with others (Beijaard et al., 2000; Cooper & Olson, 1996). Thus, teacher identity does not only depend on teachers' sight of their identities. It has two windows; narrated identity window (which shows the view of the teacher himself/herself) and designated identity window (representing the perspective of others towards the teacher's identity) (Sfard & Prusak, 2005). To date, most research focuses on one perspective.

2.2.1. Teacher identity framework by Beijaard, Verloop and Vermunt (2000)

This study grounds in the framework developed by Beijaard, Verloop and Vermunt (2000), which categorizes the components of teacher identity and influencing factors. Based on their framework’s categorization, teacher professional identity was defined under three major types of teachers' knowledge: the teacher as a subject matter expert, the teacher as a pedagogical expert, and the teacher as a didactical expert. Furthermore, the framework indicates that teachers’ professional identity is shaped by three main influencing factors: teaching context, teaching experience, and the biography of the teacher (Beijaard et al., 2000).

Figure 1

Teacher Profession (Beijaard et al., 2000).



Subject matter expertise is about a teacher’s level of ability to convert subject matter knowledge into teachable knowledge. Thanks to this skill, teachers “can change programs, develop effective tasks, explain things at a high-quality level, and diagnose students' understandings and misconceptions adequately” (Bennett and Carre, 1993). This skill makes it imperative to have a deep and full understanding of the subject area (Beijaard et al., 2000; Calderhead, 1996).

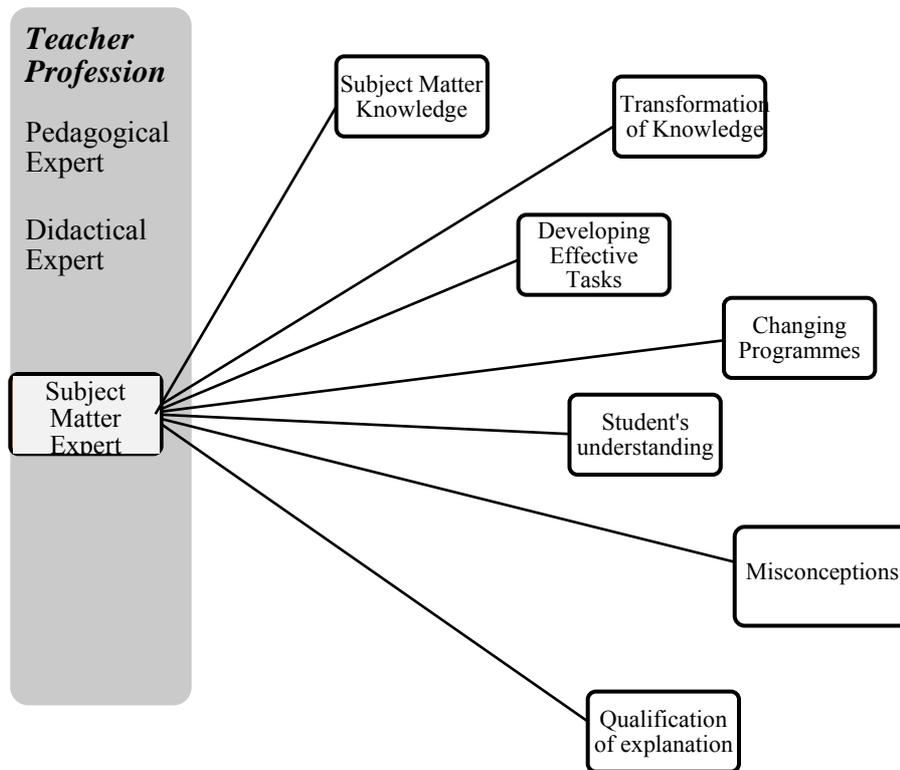


Figure 2 *Subject Matter Expert (Beijaard et al., 2000).*

Secondly, the framework defines pedagogical expertise. According to Beijaard and De Vries (1997), this expertise is the most important one among all three. This expertise is directly related to the relationship and connection with students and leans on several interfaces as listed below;

- Internalization of ethical and moral issues,
 - Having good conversation and social intelligence skills,
 - Ability to recognize different social backgrounds,
 - Having plans for unexpected results born by individualization which exchange in social control,
 - Having methods to handle students' "deviant" behaviours,
 - Catching the technological innovations and other sources of information,
 - Having methods to recognize and overcome students' emotional issues
- (Beijaard and De Vries, 1997).

These skills facilitate a teacher’s awareness, readiness and communication skills and enhance the quality of students' learning processes since the teacher can more easily realize what the student thinks and what the student needs. Additionally, teachers can more correctly indicate the right methods with fewer dilemmas to overcome encountered problems (Beijaard et al., 2000).

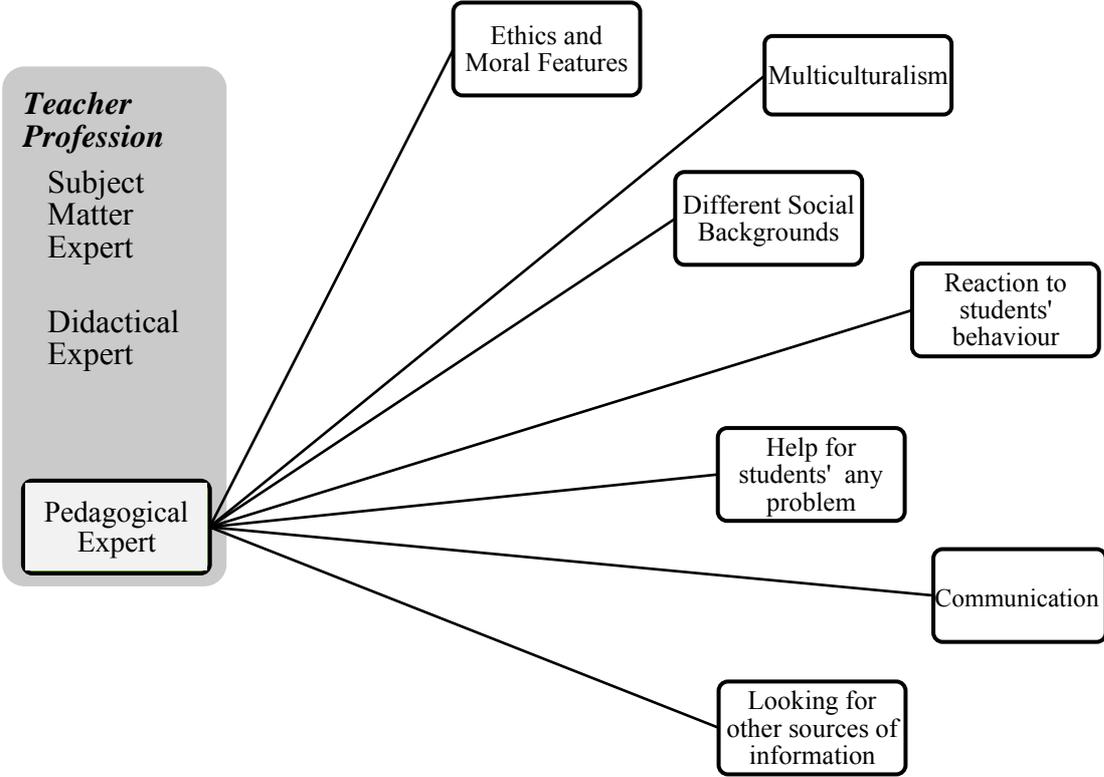


Figure 3 Pedagogical Expert (Beijaard et al., 2000).

Finally, didactical expertise is reported to be related to the internalized philosophy of the teacher, because this expertise focuses on mainly the aspects of teaching. A teacher follows the traces of his/her educational philosophy during planning, execution, and evaluation of lessons, so the teacher decides the teacher-centred or student-centred conceptions following her/his philosophy. According to the framework, if a teacher is an expert in didactics s/he ought to be more of a facilitator of learning and less of a transmitter of knowledge. Also, a didactically expert teacher focuses on knowledge construction and transmission to the usage of it through process-oriented instruction. Furthermore, it was stated that didactical expertise facilitates

teacher identity development since it helps the teacher to see her/his role more clearly (Beijaard et al., 2000).

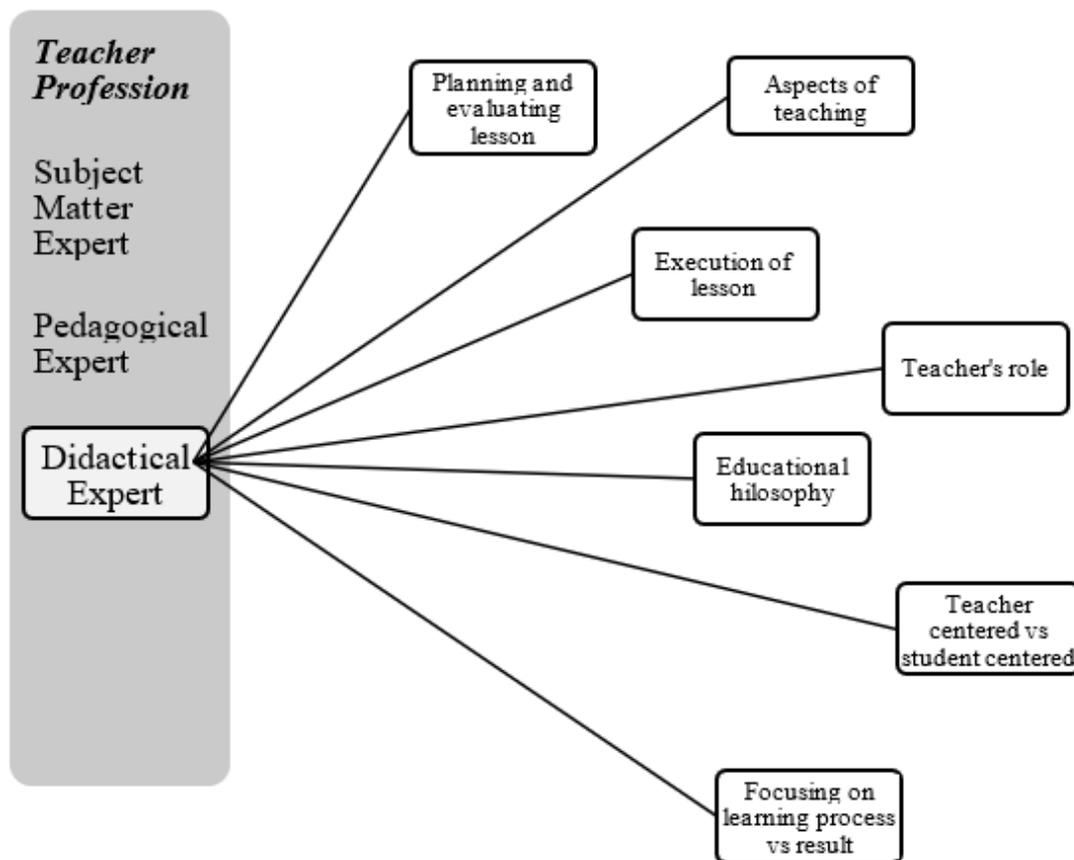


Figure 4 Didactical Expert (Beijaard et al., 2000)

The framework includes three influencing factors to orient conceptualization of teacher identity as well: teaching context, teaching experience, and biography. Teaching context directly refers to circumstances: physical convenience, ecology and culture of the teaching environment. Ideas, notions, values, mission and vision of a particular school represents the expectations and these expectations can shape the way teachers work (Beijaard et al. 2000; Nias, 1989); thus, it shapes the professional identity of the teacher working there (Beijaard et al., 2000; Reynolds, 1996) because teachers'

professional evolution is also depends on the work environment (Yinger & Hendricks-Lee, 1993).

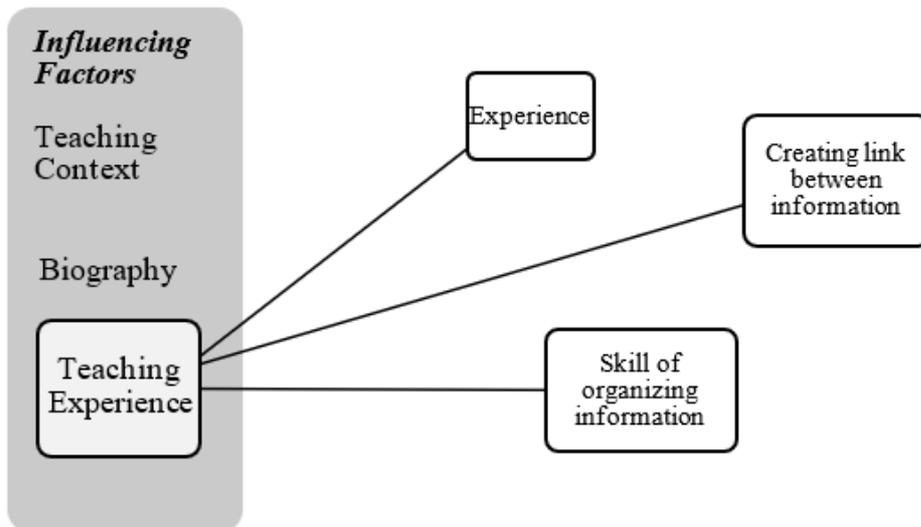


Figure 5 *Teaching Experience* (Beijaard et al., 2000)

Through teaching experience, teachers gain a greater grasp of specific points of teaching, can organize more complex knowledge fast and more easily and can show and explain different dimensions of information. Also, teachers built-in resistance through the experiences with difficulties they faced in their career can enable them to better understand not only what teaching is and who a teacher is but also who they are as a teacher. Finally, the biographies of teachers are considered to be among the influencing factors of teacher identity. The emotional memories in teachers' lives have a great impact on their understanding of the world. Previous role models, prior education, family life and all other occurrences are indicative of teachers' tolerance towards students and behaviours at work, and source of their motivation and commitment (Beijaard, 1995; Kagan, 1992).

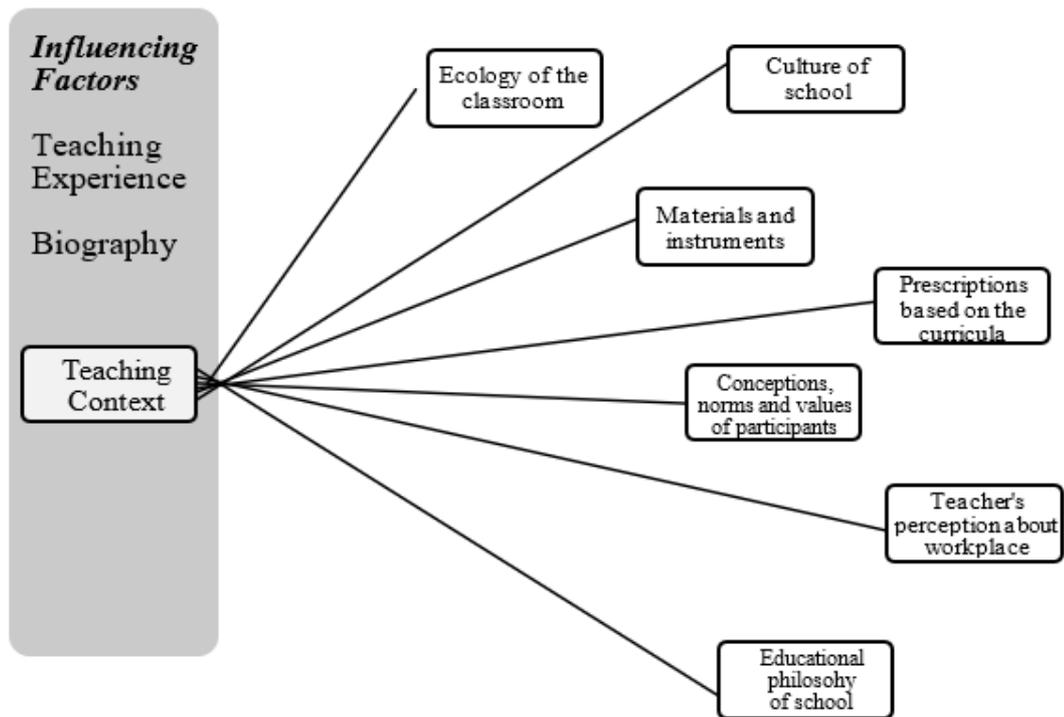


Figure 6 *Teaching Context* (Beijaard et al., 2000)

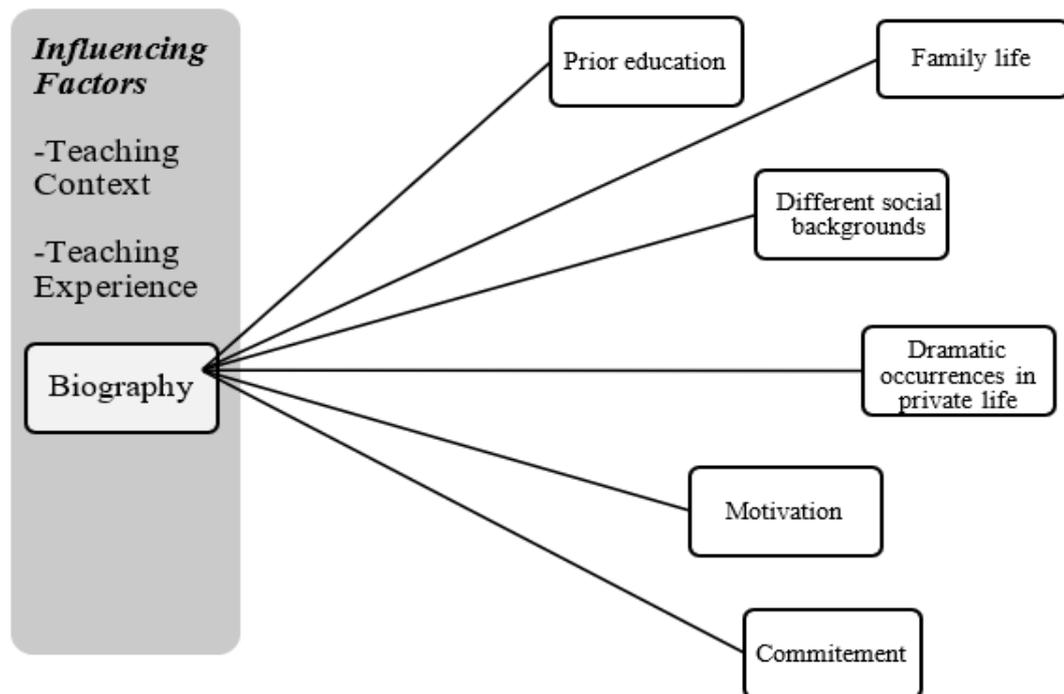


Figure 7 *The Biography of The Teacher* (Beijaard et al., 2000).

2.2.2. Pre-service Teacher Identity

When considering the significance of the teacher identity, many research studies highlight the beliefs and ideas of pre-service teachers about teaching practices (Feimen & Nemser, 2001; Swars et al, 2009; Wilson & Cooney, 2002).

The construction of teaching practices is based on knowledge and dogmas constructed in the pre-service stage. The infrastructure of the personal philosophy about how to teach is set up in the pre-service stage through creating a link between theory and practice and with the help of anticipated future experiences which can affect professional identities and estimated hardships that will struggle identities through the career. Therefore, the construction of teacher identity in the pre-service stage is very crucial for teacher candidates (Dickinson, 2012).

Although the professional identity of teachers is a subject that has been studied more in recent years throughout the world, there is still not enough work on teacher preparation programs (Lerseth, 2013). Pointing to the teacher identity which is critical for teacher education practice, Bullough (1995) explains this concept as "understanding pre-service teachers' views on learning and teaching and themselves as teachers, is vital to teacher educators as it is the basis of meaning and decision making" (Bullough, 1995).

When the literature is examined, it is seen that 3 common points between teaching-learning processes are emphasized (Darling-Hammond, Hammerness, Grossman, Rust & Shulman, 2005):

1. Pre-service teachers should first recognize and accept their prejudices in the classroom environment, based on the experience they have gained over the years.
2. In order for students to put theory into practice, both the theoretical and practical part of the subject should be understood in detail before the teaching process.
3. Also, prospective teachers should be able to recognize and deal with the complexities of the teaching process. For this, it must also control its learning processes.

In a study conducted in 2010, they examined the perceptions of pre-service teachers regarding their teaching identities in various periods of their education and

stated that individuals' opinions changed after the professional experience. With experience, it was observed that there was a decrease in teachers' self-efficacy thoughts in classroom management. (Lamote and Engles; 2010). Hence, prospective teachers need an education that supports their teaching identity from the very beginning of their professional education life. In a nutshell, the pre-service stage can be considered as the process of identity evolution from being a student to being a teacher for prospective teachers (Rostock, 2014).

2.2.2.1. Pre-service Math Teacher Identity

The number of research about professional identity in mathematics education began to increase in the 21st century (Darragh, 2016). Literature suggests that all pre-service math teachers have a math teacher identity recognized by their instructors, students, co-workers, and administrators and have their vision about who they are as mathematics teachers (Rostock, 2014) which is pivotal in indicating their initial teaching practices when they start teaching professionally (Kagan, 1992).

Raymond (1997) noted that teachers' beliefs on math form the high percentage of their mathematics teaching practice. Thus, when teachers' beliefs about math teaching evolve, their identity and their teaching practices will evolve too. According to the literature, well developed conceptual understanding of teaching mathematics needs two things; one is pre-service teacher education programs which focus on cognitive constructs associated with the awareness, knowledge, beliefs, and attitudes about how to teach math traditionally (Swars, Smith, Smith & Hart, 2008); the other one is participating communities of practice (Barko, 2004; Wenger, 1998).

Holland et al. (1998) studied the preservice math teacher's identity development throughout the teacher education program. In the research, there is an imaginary classroom environment where pre-service maths teachers can experience teaching. Pre-service teachers played two roles (student and teacher roles) during the research and dealt with some simulated situations. As a result, they concluded that pre-service teachers' prior dogmas about teaching and learning mathematics affect how they respond to the pedagogical and didactical reforms and that teacher education

programs can strengthen professional teacher identities which can prepare pre-service teachers better to face reforms in education.

Brown (1999) also conducted a study about pre-service teachers' expectations on what it is to be a mathematics teacher. They concluded that pre-service teachers face many internal and external factors which can change their expectations when they experience a real classroom. Also, these factors probably cause a dichotomy between the theoretical and the actual model of a mathematics teacher in her/his mind.

Thus, teacher education programs should be designed as a supportive environment for pre-service teachers because teacher learning in pre-service stage has an important role in math teacher identity development (Alsup, 2006; Holland et al., 1998).

2.3. Reflection

The first definition of reflective thinking was done with Platonic Theory, the theory of Socratic questioning and dialogues. At those times, Aristotle highlighted the importance of learning through Socratic questioning and criticizing (McKeon, 1941). Afterwards, Rousseau brought a new perspective to learning by highlighting the self-criticizing instead of the institutional dogmas (Foxley, 1969). Today, reflection is described as the cognitive process of (re)constructing expertise, awareness or knowledge (Korthagen, 2001), and researchers declared reflection as a pivotal notion in teacher training and development (Wopereis, Sloep & Poortman, 2010). It is also identified as "a key means by which teachers can become more in tune with their sense of self and with a deep understanding of how this self fits into a larger context which involves others" (Beauchamp & Thomas, 2009) and this makes it a part of identity development (Chen, 2018).

The origins of reflection and current description of it in education are mostly attributed to Dewey (1933). Dewey (1933) explained reflective reasoning as the "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (p. 9). According to him, two terminologies -sequence and consequence- are the cores of reflective thinking. Thinking can be reflective only if it

is rationally sequenced and involves a reflection of the consequences of an action. According to him, reflection is an act of looking back on opinions and ideas to be sure about whether they are logical, evidence-based, or both, and is looking forward for the new opinions or outcomes of a specific plan of action. He also noted that reflective thinkers are reviewers of the opinions they experienced. They are searching for rationalizing their thoughts, which will make them determine their doubts and confusion. Dewey's definition of reflection has been interpreted for teaching experiences in which the purpose of reflection has been determined as the ways of understanding what goes on in the subconscious of teachers who promote learning.

Dewey also criticized teacher preparation since its restrictions about the skills aimed to be gained by teachers, applied methods and instruments. According to him, these restrictions turn teacher preparation to strictly technical training which is fixing the teacher candidate's awareness rather than expanding it to realise their students' thinking processes. He suggests that pre-service teachers could learn how to manage classrooms, but they could not learn how to recognise students' thought or how to teach them to think when they were advising students to think. They would conceptualize teaching methods but would not discuss the principles or philosophical background of their methods. Because these teaching candidates may learn just the "how"s but not the "why"s of education, they could not be ready for unexpected experimentation because of dogmatic decisions. Following Dewey, two other most attributed people about the utilization of reflection by teachers had strongly suggests more studies to develop understandings and conclusions on reflective teacher education (Van Manen, 1977) and defined reflective teachers as the ones who can look back on experiences, get recommendations about them and develop their teaching practices in light of profession, investigation, and moral principles (Valli, 1997).

According to the literature, reflective writing and teacher satisfaction on professional development have become popular compared to the past (Frechtling, et al., 1995). The common point of the studies demonstrates that an individual's perception about her/his experiences ought to be reviewed critically since it helps them to reshape the plans in line with the new conclusion (Scanlan & Chernomas, 1997). It's argued that a reflection makes new teachers explore their positions as educators,

particularly and make them construct powerful ideas about what teaching should seem like and this makes reflection a worthy tool for teachers (Rushton, 2004). The most essential point of reflection is that it is a guide to non-experienced teachers about making substantial and significant changes in their profession; after a while reflection makes them to think more actively about their teaching and to analyze why outcomes cannot meet the anticipated results (Schön, 1990).

2.3.1. Anticipatory Reflection

Mezirow (1998), described reflection as ‘turning back to experience’ which creates awareness on a thought, situation, emotion, behaviour, intent, tendency or sensation. However, Conway (2001) asserted that writing reflection does not require to be retrospective, it might be anticipatory or prospective because reflection also allows teachers to consider future practices.

In the literature, researchers defined anticipatory reflection as a sort of ‘future-oriented’ reflection or as ‘pre-active reflection’ directing us to think on potential options to select during a future action and predict the occurrences we and others may experience after expected situations or planned actions occurred (Van Mannen, 1995) or as ‘reflection-for-action’ which implies composing plans on redesigning future works (McAlpine & Weston, 2000; Tracey et al., 2014) or ‘prospective reflection/foreseeing reflection’ which improves a teacher’s foreseeing ability and strengthen professional identity development (Conway, 2001) and help teachers to make meaningful decision to identify possible problems, to investigate and to evaluate (Urzua & Vasquez, 2008).

Anticipatory reflections help teachers to investigate their teaching identities and to see their professional progression in pre-service teacher education programs (Chen, 2018).

The literature points out that anticipatory reflective practice was not given enough importance in teacher education (Wilson, 2008). Wilson (2008) stated that thinking action belongs to the past but it is important to think about the future before action. He emphasized that the state of thought or the process of thinking that is not associated with an action is limited and just thinking is not sufficient, if it cannot be

connected with how the change should be for the future actions. Conway (2001) made similar views, mentioning the need to focus on all three time frames: the past in the present, the instant in the present and the future in the present time. In his study, the importance of reviewing the relationships between memory and imagination for teaching is emphasized. He stated that they are far from the formation of a professional self-oriented dimension. For this reason, future-oriented reflection practices are necessary for educators to encourage imagination and forward reflection and to do such activities with retrospective methods.

Pinsky et al., (1998) asserted that like reflection on past events, reflection on future may also facilitate the process of learning in the teaching profession. He conducted a study with pre-service medicine physicians, in which the participants utilized future-oriented reflections to ensure continuous and high-quality teaching. Lecturers who participated in the study mentioned that future-oriented reflective practice was an important component of their professional development in their professional life.

2.4. Role of Reflection on Teacher Identity Development

“Self-reflection” has a crucial place not only in modern philosophy (Bengtsson, 2003) but also in worldwide teacher education programs and the professional development of teachers (Noormohammadi, 2014). Killeavy & Moloney (2010) defined self-reflection as the centre of the teacher's professional completion by grounding this theory on Schon (1983)'s definition of writing reflection, the process of refining and deeper understandings of own's profession (Killeavy & Moloney, 2010; Schon, 1983).

Lester (1998) argued that reflective teachers easily link theory to practice, and reflection is a substantial factor which has a role on the success of inexperienced teachers since it affects teacher persistence, retention and resilience. Also, reflective writing develops a teacher's sense of self-efficacy, job satisfaction and ability to create stronger communication with colleagues (Braun & Crumpler, 2004). Yost (2006) supported this idea by indicating that in comparison with a positive school climate, reflective practice and self-efficacy are more important factors in the success of

inexperienced teachers. Additionally, teacher candidates can form their identities by self-reflection because internalizing the profession and creating a link between theory and practice is tied to telling and retelling the stories if the teacher is inexperienced (Binks et al., 2009).

It is a common argument that teacher identity is the key point of decisions that teachers make in their profession (Izadinia, 2013; Bullough, 1997) and studies suggest that reflective writing or autoethnography, collaborative reflection or action research have a magnitude effect on teacher identity development process (Cattley, 2007; Estola 2003; Izadinia, 2013; Maclean & White, 2007). Reflection helps teachers to make their decisions which are about curriculum, classroom management, lesson plan and materials more positively (Noormohammadi, 2014). Additionally, reflection is essential for the improvement in teaching methods and improvement in teaching methods influence identities (Graham & Phelps, 2003). Reflection not only promotes individual (aspirant) learning process and professional development (Korthagen & Vasalos, 2005; Schön, 1983) but also prepares the ground for educational change and reform (Griffiths, 2000).

2.4.1. Role of Reflection on Pre-service Teacher Identity Development

The pre-service stage is reported to be very effective in teacher identity development and self-reflection has undeniable importance during this process (Alsup, 2006). According to the literature “making thinking visible makes it available for critique and comment by oneself as well as others” (Luehmann, 2008). At that point, reflection fosters teachers’ consciousness about their teaching and triggers developments in a positive way (Liou, 2001) and it becomes one of the data collection methods (Rovegno, 1992; Rushton, 2004; Schön, 1990) for prospective teachers' viewpoints (Fagan, 2015).

According to Alsup (2006), there is a “space” between the discourses which are unfamiliar to pre-service teachers and the discourses they know as a future educator. This space constitutes a dissonance and through this dissonance, there exists a tension which causes metacognitive awareness towards discourses. This metacognitive awareness changes identity. In a nutshell, “identity is activated when

dissonance occurs. . . the activation of self is an occurrence of the need to produce a description of self” (Alsup, 2006, p. 236) and these dissonances occur thanks to the learnings occurred in pre-service stage.

Alsup (2006) stated that these dissonances faced in pre-service stage make the pre-service teacher aware of their teacher identities and if the pre-service teachers had the chance to share their ideas about these dissonances in a community it can affect pre-service teacher identity construction positively. Kang (2012) supported this argument by a study conducted with pre-service teachers. According to the results of the study, a pre-service teacher may also experience a dissonance about philosophy about their content and pedagogical knowledge or about a new ideal model of teaching that comes from their mentor or peer teachers. When preservice teachers face that kind of dissonance, their professional background and understanding gained in the pre-service stage support their identity (Kang, 2012).

According to Rushton (2004) “preservice teachers already have developed an understanding of what good teaching looks like and have an image of the type of teacher they want to be” (p.62). The expression of these inner thoughts through reflection enables them to face dissonances in their beliefs and arguments by criticizing, analyzing themselves, and therefore, promotes improvement and awareness by affording an opportunity to self-check and confer (Efimova & Fiedler, 2004).

The importance of reflective writing in the construction of pre-service teacher identity was also highlighted by Graham and Phelps (2003), who implemented an intervention program for the freshman Bachelor of Education students. The program aimed to support preservice teachers’ teacher identity development through teaching “the practical know-how of teaching”. A fundamental part of the program was teaching students how to reflect since reflection is an important tool to improve teaching expertise and teacher identity during undergraduate teacher education. According to the researchers, if teachers cannot reflect on themselves, the chances of promoting a teacher identity are found to be limited.

Cohen and Wysocky (2008) concluded that not only writing reflections but also sharing the written reflections in-preservice stage ought to be encouraged to facilitate

teacher identity construction. They stated that sharing reflections may enable them to be valid and also provide pre-service teachers with opportunities to face different perspectives. As a result of this study with a reflective discussion teacher group, Cohen and Wysocky (2008) suggested three points for teacher education programs concerning identity work. Firstly, teacher education usually focuses on teaching practices, so a pre-service teacher should recognize the impact of these practices on their teaching identities. Secondly, pre-service teachers should be supported and guided in getting used to writing reflections. Thirdly, opportunities should be created for pre-service teachers to share their reflections with their peers.

The significance of sharing reflection and its effects on a teacher's professional identity was also highlighted by McDougall (2010). McDougall, additionally, remarked that narratives that a teacher shared with his/her colleagues have undeniable support on the teacher's identity. He observed this support especially during the adaptation process to instructional or curriculum-related changes. Through this process, they can read other teachers' knowledge and skills with one another; sharing narratives makes a teacher feel like being supported through teamwork and collaboration. The author suggested that this supportive feeling aids to overcome the anxieties that may arise when professional identities are challenged.

According to Sumara and Luce-Kapler (1996), sharing experiences and thoughts in a community is a way to overcome the dissonance and challenges pre-service teachers face when they experience a real classroom setting. In their study, Sumara and Luce-Kapler (1996) handled a dissonance experienced by a novice teacher after confronting a student in a real classroom. They asked the novice teacher to share her reflective interpretations about teaching in a real classroom setting with pre-service teachers and realized that when she did it, the novice teacher became a guide for future teachers to explore the question, "Whom am I becoming?". Therefore Sumara and Luce-Kapler (1996) concluded that sharing reflections can start helpful discussions for pre-service teachers to challenge and possibly eliminate the aspects of their identities that conflict with whom they want to be as a teacher and they asserted that this is crucial for teacher identity construction. In other words, sharing reflections contribute to the pre-service teachers' awareness about who they are as they plan to

enter the teaching career. Sumara and Luce-Kapler (1996) also advocated that “Rather than uncritically celebrating the process of becoming a teacher, we [the authors] strongly believe that teacher education programs must create common places for interpretations that make explicit the various discursive practices and competing identities one brings to the process of learning to teach” (p. 68).

2.5. Research on Facilitating Teacher Identity Development and Reflection

Graham and Phelps (2003) examined the identity development of teacher candidates with metacognitive and reflective learning processes and a new approach was proposed for the identity of the teacher that suggests cooperation between universities, schools, institutions. Later, Alsup (2006) emphasized the necessity of examining teacher candidates' teacher identities and pointed out the importance of reflection on identity development. Beltman et al. (2015) investigated teacher identities of 125 pre-service teachers and reported that the prospective teachers enjoy teaching, have positive relationships with their students and trust themselves as teachers. However, the results also showed that pre-service teachers confront teaching dilemmas and struggle to face the reality of the workplace. Following Alsup and Beltman, van Lankveld et al. (2017) examined the teacher identity studies in both internship (practical) and university teaching (theoretical) contexts. The study focused on investigating how existing identities of teacher candidates change during their transition to teaching profession, which contextual factors affect teacher identity development and which psychological factors are effective in the development of the teacher identity. The results demonstrated that communication with students and personal development are effective in teacher identity development; however, the working environment also has an undeniable impact. Additionally, psychological factors that are effective in teacher identity development are listed as the sense of appreciation, sense of commitment, sense of competence and the feeling of imagining a future career.

Lankveld et al. (2016) synthesized a total of 59 qualitative studies examining teacher identity development in different theoretical frameworks and with different

data collection tools. The results demonstrated that teacher education is not perfect. To promote it, the reflections written by teacher candidates in education faculties should be taken care of interest. Motallebzadeh and Kazemi (2018) examined the relationship between English teachers' professional teacher identity and self-esteem. In the study conducted with structural equation modelling, it was observed that there was a significant relationship between teacher identity and self-esteem in all sub-dimensions. Teacher candidates who did not feel competent in the field and came to the program unwillingly could not show adequate identity development.

Djoub (2018) emphasized that providing professional development opportunities by drawing attention to the desires and emotions of teachers can support the development of teacher identity. According to the study, teaching motivation, self-description, classroom organization, teaching quality and student learning are indicated as the other highly influential factors. Also, the study emphasized that teacher education programs can solve the problems about the profession, that pre-service teachers may face, by encouraging teachers to discover their own emotional experiences in teaching and to develop their pedagogy. This sort of discovery can evolve pre-service teachers' philosophies and beliefs.

There are also some studies conducted in Turkey. Also, When the content of the studies in Turkey considered, some of the results in terms of teacher identity development or teaching certificate programs are classified as follows:

- a. Efforts to develop teacher identity are based on the teacher identity development of pre-service teachers (English language) rather than teachers working in the field (e.g. Kartal & Afacan, 2012).
- b. Studies on alternative teaching certificate programs are insufficient, not considering the PID of teachers working in non-teaching fields and only focusing on teachers' motivation (e.g. Kartal and Afacan, 2012)
- c. Most of the work done is inadequate as they are primary/secondary school-based (e.g. Gökçe, 2010; Taneri & Ok, 2014).

Eğmir (2018) summarized the general structure of some of the studies in this field through synthesizing 35 theses accessible from YÖK National Thesis Center and 19 articles in ULAKBİM Social Sciences Database and Google Scholar search engine.

He stated that the number of Turkish publications about reflective thinking has increased especially after 2008-2012. In these studies, generally, documents or scales were used, and mostly qualitative methods and situation analysis were conducted to evaluate the effect of some intervention methods on reflective thinking, and the relationship between the effectiveness of the teacher and reflective thinking ability. As a result, studies generally showed that performed interventions positively affects reflective thinking and reflective thinking positively affects teacher efficiency.

In the experimental study of Tok (2008), the positive effects of reflective writing were investigated with 63 first grade students in the Primary Teaching Program. In the study, pre-service teachers were divided into experimental and observation groups. Students in both groups were asked to create learning activities and make self-evaluation for their work and the students in the experimental group were asked to write reflections for 12 weeks. The personal reflection writings, learning activities and self-evaluations of the students in both groups were evaluated and it was stated that the experimental group had more positive results about generating learning activities when the data were collected with the enhanced reflection activities.

Similarly, Akkoyunlu et al. (2016) examined pre-service teachers' perceptions about the effectiveness of reflective diaries with 20 pre-service teachers, who were enrolled in the "Teaching Practice" course of the Department of Computer Education and Instructional Technologies. They were generally positive about the intervention and three of the pre-service teachers were contacted one year later to talk about their transition from pre-service to in-service. The teachers reported reflective diaries as useful as they spent time on to write and produce something, evaluate themselves, to gain new perspectives by reading each other's diaries and gain a sense of responsibility. Also, teachers stated that reflective diaries made a great contribution to both professional and personal development.

Arpacı and Somuncu (2016) examined the effect of pre-service teachers' identity and personal characteristics on teacher self-efficacy and concluded that all dimensions of self-efficacy were effective in identity development. Yaylı (2012) used the term "self-annotation" to define reflective thinking through examining self-identity awareness in her study, in which the participants' literacy narratives, self-annotation

excerpts and their post-instruction views on self-annotation writing were qualitatively analyzed and highlighted the importance of self-annotation which raise awareness and autonomy. Koca (2016) examined the effects of education faculty programs on teacher identity development with 162 prospective music teachers from different universities in Turkey. It was seen that pre-service teachers' perceptions of early teacher identity were found to be "high" in both all sub-dimensions of the scale and total score. It has been stated that teacher candidates with high professional confidence behave more positively towards students, motivate their students better, and take on the roles of teachers that they can enjoy their profession. In a similar effort to better understand the factors affecting the development of teacher identity development Yaşar et al. (2013) studied with preschool teachers and reported that personality traits, desire to teach, education received at the university, environment and practicum are found to be effective in the development of their teaching identity, and teachers reported that they had been feeling like teachers since the third grade of the university.

On the contrast, in the study conducted by Ceylan and Akkuş (2018) with pre-service mathematics teachers, the internalization of teacher identity was examined year by year. They utilized Early Teacher Identity Measure developed by Friesen and Besley (2013). The result demonstrated that 1st-grade pre-service teachers got higher scores in the "seeing oneself as a teacher" and "participating teacher" dimensions of the measure. That means the pre-service teachers have stronger teacher identity in the first year in their college compared to the following years.

According to the study of Koçak et al. (2012) in which the identity formation and educational beliefs of pre-service teachers were examined, teacher candidates have already formed their ideal professional perceptions in the pre-service stage and they think that their current argument about their professional efficiency is enough. Today's teacher candidates are in the understanding of contemporary educational philosophy but do not have any concerns about future practices.

In her study, Çelikdemir (2018) aimed to investigate preservice middle school mathematics teachers' professional identities development through a video case-based reflective community in a state university of Turkey. Data were collected from 12 preservice teachers' interviews, video reflection memos, reflective writings, group

discussions and evaluation forms throughout a term. The results of the study indicated that reflective community and reflections facilitate self-awareness and interpretation ability of teacher candidates over time.

Koç and Yıldız (2012) studied with 19 primary school teacher candidates to understand the conflicts that affect their understanding of self-efficiency, and that they face in their internship practice in their last term. In the study, an intervention about mentoring pre-service teachers was prepared and the pre-service teachers were asked to keep reflective diaries in which they express their thoughts about their experiences. The content analysis indicated that effective factors on pre-service teachers' self-efficiencies were, the approaches adopted by teacher candidates for planning, implementation, teaching, and conflicts about learning-teaching and classroom management.

Ekinci and Delen (2016) conducted a study with 65 Science and Elementary Mathematics Teacher candidates who are in the fourth grade and taking the "Teaching Practices" course. During the study teacher candidates wrote reflective diaries. With the help of the examined diaries written by the candidates, their perspectives of mathematics teaching and science teaching were indicated. Besides, it was suggested to support their internship practices with theoretical courses in the last term of a college education.

Oruç (2013) investigated how professional identity is established by the reflective journals with an intern teacher. The study adopted a qualitative method and the results indicated that the teacher's professional identity is formed by three factors; work setting, professional experience and practicum.

Bener and Yıldız (2019) studied on teacher identity development of 8 pre-service English teachers at a state university in Turkey. Teacher candidates had participated in blog posting activities applied for the thought process of preparing the block activity. With the study, it was stated that engaging in blog activities enabled preservice teachers to direct reflective thinking, thus enabling them to think more deeply.

Darragh (2016), in her study, which compiled studies on identity in mathematics education published in the last two decades, formed a ground for criticism

on the subject and examined 188 articles from 85 journals in total. In the study, the use of the concept of identity especially in the field of mathematics was mentioned and it was stated that it provided information to help to learn. Also, the confusion and deficiency in the definitions of the concept of identity were addressed, and she stated that there are two different paradigms in the literature sociologically and psychologically. In the study, it is especially emphasized that identity is seen as an action that is the performance of the self and thus can be adapted to the sociological framework. It was stated that identity is performative and that we take action to keep it alive. It has been emphasized that the results of identity research will be in this direction.

2.6. Summary of the Literature Review

In summary, the literature points out that reflective practices play important roles in teacher education to support teacher identity development. These practices prepare teachers to think critically and reflectively, enabling them to enter their careers with the capability for continuous professional development (Lester & Mayher, 1987; Mule, 2006) By reflective writing teachers can expose the restrictions and determine how much their ideas about teaching requires revision (Sockman & Sharma, 2008) for their future actions (Conway, 2001).

Anticipatory reflection in teacher education programs is also reported to be important in facilitating identity development (Urzua & Vasquez, 2008). Anticipatory reflection is an effective approach to be utilized before teaching experience (Pinsky, Monson & Irby, 1998) as it involves both anticipation and imagination and extends the thinking process towards the future (Moon, 2000).

Moreover sharing their personal lives and beliefs in their college course work is crucial for future teachers' identity development (Flores & Day, 2006), so pre-service curricula ought to provide opportunities for prospective teachers to reflect on their personal life stories their thoughts and beliefs (Brandt, 2008) for their future practices; moreover, identity work by facilitating preservice teachers to reflect should be supported with interventions in pre-service stage (Graham & Phelps, 2003).

Thus, not only writing narratives and reflections but also sharing them is important for the construction and development of pre-service teacher identity. In this study, we focused on the effects of reflective writing on the teacher identity construction process during the pre-service stage by sharing the reflections on an online platform.

CHAPTER 3

METHOD

This chapter presents the method of the study together with the study design, research questions, sample, data collection instruments, data collection procedures, data analysis procedures, and the limitations of the study.

3.1.Overall Design of the Study

This is a mixed-method study in which qualitative and quantitative methodologies were combined to investigate the effect of weekly online anticipatory reflective writing on pre-service Mathematics teachers' professional identity development.

The term “mixed methods” refers to a methodology of research that promotes the methodical combination, or “mixing,” of quantitative and qualitative data in a single study (Creswell & Wisdom, 2013). The unique axiom of this methodology is that this sort of synthesis of qualitative and quantitative data allows a richer and more comprehensive and synergistic utilization of data than untied quantitative and qualitative data collecting and interpretation since mixed-methods lead to see contradictions between quantitative and qualitative outcomes (Creswell & Clark, 2011). Additionally, mixed methods allow researchers to elucidating more information than can be obtained in quantitative research. Researchers can support their findings with participants' experiences by giving a voice to study participants. Also, mixed methods design provides methodological flexibility to the researcher since it is adaptable for many study plans, such as observational studies and randomized trials (Creswell & Wisdom, 2013). However, timing and weighting decisions should be done to conduct the most appropriate mixed-method design. The timing of the mixed method refers to the ‘temporal relationship between the qualitative and quantitative components within a study’ (Creswell & Clark, 2006).

The timing of the mixed method demonstrates when the data is collected and analyzed and refers to the sequential or concurrent transient relationship between the qualitative and quantitative components of a study (Creswell & Clark, 2006). In other words, timing describes when the data are used in research. Mixed methods are classified by timing as two styles: sequential and concurrent. The concurrent timing occurs when both qualitative and quantitative methods are implemented in the same research while sequential occurs when the methods are separated into two phrases for data collection or data analysis (Creswell & Clark, 2006). In this study, quantitative and qualitative data were collected and analyzed at the same time. Thus, this study is a concurrent mixed-method study.

When the weight of a study is handled, the priority and the importance of data should be considered. If qualitative data were collected to support the quantitative data or the exact opposite, this study becomes an equally weighted mixed method. If both methods have the same level of importance, then equal weighting is utilized in the study (Morgan, 1998). In this study, the focuses of both qualitative and quantitative data will be on the different research questions, they will help to answer different questions. The quantitative measure will be utilized to answer the second research question while the qualitative data will mostly help to answer the first and third questions, so they will have equal priority and the study will be equally weighted.

According to Creswell and Clark (2006), if a mixed-method study is conducted concurrently with equal weighting, its design type is called a triangular mixed-method and in a triangular mixed method, findings are mixed during the interpretation or analysis stage.

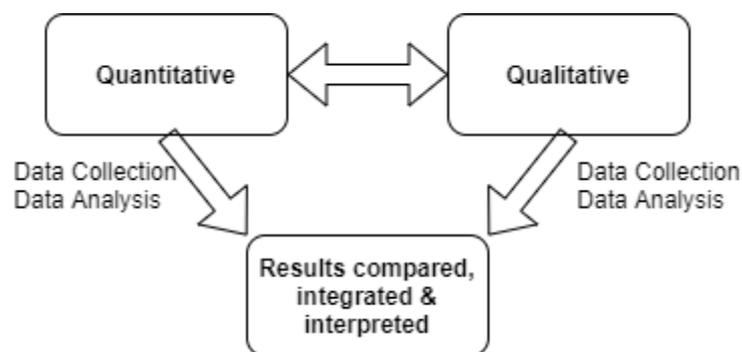


Figure 8 *Triangular Mixed Method Design*

To understand the effect of online anticipatory reflective writing in facilitating pre-service teachers' professional identities and pre-service teachers' perspectives about the process in this study, concurrent mixed method design employed, and the aspects of a quantitative survey with qualitative interviews combined during the interpretation of data.

For quantitative strand of the study, one-group pretest-posttest quasi-experimental design was employed. One-group pretest-posttest quasi-experimental design is generally used when the same dependent variable (teacher identity) of the same group of participants (31 pre-service Mathematics teachers) were measured before and after the intervention (online anticipatory reflections) (Campbell & Stanley, 1966) as demonstrated on Figure 7. A paired t-test was conducted for quantitative data analysis.



Figure 9 *The One-Group Pretest-Posttest Quasi-Experimental Design*

According to Fraenkel, Wallen, and Hyun (2015), some threats of internal validity might be faced; in other words, the changes observed in the dependent variable can be related to unintended variables rather than independent variables. For this study, the dependent variable was the teacher identity of pre-service elementary math teachers, the independent variable was anticipatory reflective writing. The development in the participant pre-service teachers may be regarding other factors such as experiencing teaching instead of anticipatory reflective writing. To minimize the effect of these factors, the mostly handled threats of internal validity were considered. According to Cook and Campbell (1979), the most observed internal validity threats for a pre-test post-test one-group design are primarily history, maturation, testing, instrumentation, and statistical regression. In this study, to minimize subject characteristics threat, pre-service teachers were selected from the

same grade level, and their ages were between 21 and 25. Mortality is commonly known as loss of subject. To minimize mortality, the intervention was designed as part of most course participants have to take. Reflective writings were given to pre-service teachers as graded weekly assignments. Additionally, one on one interview was arranged with 3 volunteer participants who did not appropriately follow the directions of the intervention to understand the underlying reasons for not participating in the intervention properly and the results pointed out that the reasons generally stemmed from personal choices. To minimize the location threat, conditions were standardized. Each pre-service teacher got the ETIM in the same classroom for both pre and post-measurement, and interviews were carried on in the same place. To minimize the testing threat, the same measurement instrument was utilized after 3 months. To minimize maturation threat, during the interviews pre-service teachers were asked about factors such as the educational courses they took, their teaching experiences, and other social or personal factors that they believe might have affected their teacher identity development during the intervention period. To minimize statistical regression, a time-reversed analysis was done; in other words, posttest-pretest was applied to see the true treatment effects (Cook & Campbell, 1979).

For the qualitative strand of the study, thematic analysis approach was adopted and thematic coding was conducted. Boyatzis (1998) defined thematic coding as a specific qualitative analysis tool that can be utilized across different qualitative methods such as grounded theory or narrative research. Similarly, Ryan and Bernard (2000) mentioned thematic coding as a process that can be conducted within the grounded theory. However, Braun and Clarke (2006) emphasize thematic analysis as the foundational method of qualitative analysis since thematizing is the main step of the many other forms of qualitative analysis. In the literature, some studies (e.g. Aronson, 1994; Boyatzis, 1998; Kogan et al., 2011; Ryan & Bernard, 2000) accept thematic analysis just as a qualitative method; however, in some publications (e.g. Braun and Clark, 2006; Given, 2008; King, 2004; Leininger, 1992; Tanaka et al., 2012; Tanaka, 2000) it was handled as an independent qualitative approach rather than just a method. In this study, based on the definition of Braun and Clarke (2006), thematic

analysis was adopted as a qualitative approach and utilized both for the first and third research questions.

Braun and Clarke (2006) stated that thematic analysis is a process for identifying, organizing, analyzing, describing, and reporting patterns of themes within data. The thematic analysis does not need any pre-existing theoretical framework. It examines particular themes or theme patterns beyond the whole data set, instead of a specific data item, such as an individual interview or interviews of a person.

According to Braun and Clarke (2006), through thematic analysis, patterns within the themes of data can be recognized in two ways: in an inductive or “bottom-up” way and theoretical or deductive or “top-down” way. Similarly, Given (2008), defines thematic analysis as a data modification and analysis procedure by which qualitative data are segmented, classified, summarized, and reproduced in a way that catches the significant ideas in the data set. The inductive way is selected if data coding is carried out to generate a pattern rather than using a pre-existing coding frame or conception. This sort of data analysis is data-driven similar to grounded theory. On the other hand, the theoretical thematic analysis is more likely to be "analyst-driven" since it would be disposed to be driven by the researcher's conception. The inductive analysis can provide some researchers to see more aspects they could not consider in the utilized frame; therefore, it can a more deep description of data than thematic analysis. The selection of the thematic analysis way should be based on the reason for coding. If researchers have a strictly specific research question, then the coding process accords with the theoretical way; if researchers have evolvable research then the coding process accords with the inductive approach.

In this study, although both the first and third research questions were examined through thematic analysis, the first question was based on the framework of Beijaard et al. (2000) while the third one was mapped onto the pattern will emerge from data itself. Thus, for the first question theoretical (deductive) thematic analysis was conducted while the third research question was examined through the inductive thematic analysis as described by Braun and Clarke (2006).

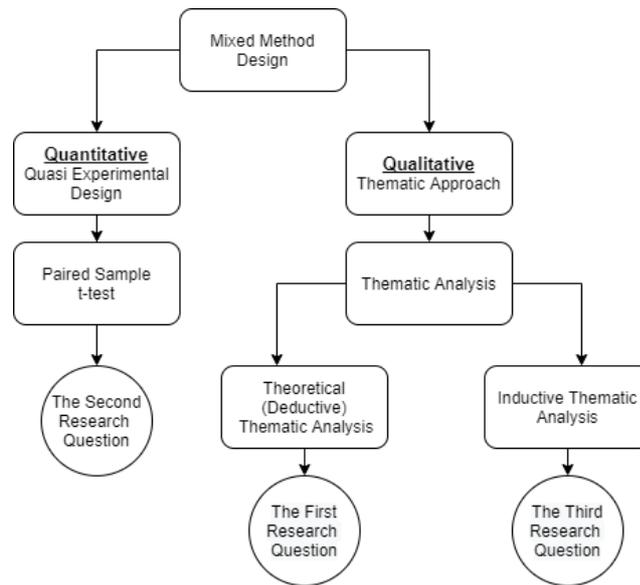


Figure 10 *The Methodology of the Study*

3.1. Research Questions

This study aimed to gain insight into the development of teacher identity during pre-service education by online anticipatory reflections. Research questions are indicated as given below;

1. How do pre-service math teachers perceive their professional identity?
2. What effect do weekly online anticipatory reflections have on pre-service teachers' professional identity development?
3. What are pre-service teachers' perceptions about the weekly online anticipatory reflections?

3.2. Sampling

In the literature, random sampling is generally connected with quantitative research, while non-random sampling is associated with qualitative research (Onwuegbuzie & Leech, 2005). However, although non-randomized sampling negatively affects the external validity (i.e., generalizability) of outcomes, most of the quantitative research studies employ it either. Since the huge majority of both

qualitative and quantitative studies conduct non-random sampling, the non-random sampling schemes are reported to be appropriate to use in mixed methods (Onwuegbuzie & Collins, 2007). The selection of sampling frame (i.e., random vs. non-random) should be done according to the sort of generalization of interest (i.e., statistical vs. analytic). “Statistical” generalizations are generalizing outcomes and results from a symbolic statistical sample to a population from which the sample was selected while the “analytic” generalization is just a case-to-case transfer of a concept (Kennedy, 1979). Before picking a sampling design, mixed methods researchers ought to determine the aim of the study (Onwuegbuzie & Collins, 2007).

Since the aim of this study was to examine the effectiveness of an intervention applied with elementary Mathematics teachers in a single state university and the study does not aim to generalize the findings of the intervention program, convenience sampling is a non-random sampling method was utilized. According to the description of Onwuegbuzie and Collins (2007), convenience sampling is choosing contexts, groups, and/or people that are conveniently accessible and volunteer to participate in the study. 46 pre-service teachers taking Instructional Technology and Material Development Course (ITMDC) at a well-known state university participated in the intervention and among them, seven participated in the interview. However, data of 15 of the participants were excluded from the study because 10 of them did not write reflections weekly, one of them wrote all the reflections at the end of the semester, of them did not answer all questions in of Early Teacher Identity Measure (ETIM) or answer the questions partially and the rest did not complete weekly reflections. As a result, the data of the study were collected from 31 pre-service Math teachers.

At the end of the semester, individual interviews were conducted with three participants who were excluded to understand the reason behind late uploading. They stated that since the effect of each reflection on their grade was only one point, skipping some of the assignments or writing them after the due date did not mean they will get a low grade from the course and the workload of the term was hectic so they decided to skip some of the reflection assignments, especially during the exam weeks. Also, they stated that sometimes they forget to write even though they are meant to write.

3.1.1. Characteristics of the Sample

The participants of the intervention were comprised of 31 junior pre-service elementary Mathematics teachers who study at a well-known public university in Turkey. All the participants completed the basic mathematics instructions such as Calculus, Analytical Geometry, and so on while none of them completed educational instructions such as teaching methods of maths, classroom management, and so on. The number of male participants was 4 (13%), and the number of female participants was 27 (87%) (Table 1). The ages of the participant pre-service teachers were between 21-23.

Table 1

Characteristics of the Sample

	Gender				Total	
	Male		Female		n	%
	n	%	n	%		
21	2	50.0	8	29.6	10	32.3
Age 22	2	50.0	8	29.6	10	32.3
≥23	-	-	11	40.8	11	35.4
Total	4	100,0	27	100,0	31	100,0

Note. Min: 21, Max:25, Median:22, Mean±SS:22.19±1.108

According to Table 1, among the pre-service teachers participating in the study, 31 pre-service teachers could be included in the analysis. Of the 31 participants, four of them were males, 27 of them were females and their average age was SD: 22.19 (\pm 1.108), the median was 22.

3.2. Data Collection Instruments

In this study, Early Teacher Identity Measure (Friesen & Besley, 2013) (Appendix C), and an interview schedule is used to collect data.

3.2.1. Early Teacher Identity Measure

This scale was developed by Friesen and Besley (2013) to measure the participants' understandings of the early development of their teacher identity. The scale was a five-point Likert-type scale anchored from one (Disagree) to five (Agree) and consisted of 17-items. Four items were reverse coded. Single items were categorized under three subscales. The first subscale, 'self-categorization as a teacher' was evaluated through five items that drew participants' description of themselves as a teacher. The second subscale 'confidence in becoming a teacher' was composed of six items showing participants' self-confidence about their capability to improve required skills and sources to be a successful teacher. The third subscale, 'natural inclination towards children and teaching' was evaluated by 6 items and exhibited participants' beliefs about being naturally associated and satisfied with teaching or supervising children. Internal consistency reliability of the measure was reported to be good (alpha = .87, corrected item-total correlations ranged from .28 to .74, N = 109) (Friesen & Besley, 2013) and test-retest reliability was acceptable (Time 1 alpha = .83; Time 2 alpha = .88; Time 1 to Time 2 correlation = .62, $p < .001$. Time 2 alpha = .77, corrected item-total correlations ranged from .25 to .53; Time 1 to Time 2 correlation = .56, $p < .001$). Comparisons along the 3 sub-dimensions of self-categorization, confidence/self-efficacy in becoming a teacher, and natural inclination towards children and teaching were also conducted since Cronbach alpha results for the pre-survey and the post-survey showed sufficient internal consistency (Table 2).

Table 2

Cronbach Alpha Values Obtained for Each Sub-Dimension of the Teacher Identity for the Pre- and Post-Intervention.

	Self-categorization	Confidence	Natural Inclination
Pre-Intervention	0.857	0.794	0.840
Post-Intervention	0.648	0.799	0.806

The language proficiency of the respondents is reported to affect data quality. If the respondents do not comprehend the questions correctly because of their language proficiency they are less likely to respond incorrectly (Wenz, Al Baghal & Gaia, 2020). The mother tongue of all participants in this study was Turkish and the language of Early Teacher, Identity Measurement was in English. As the medium of the language of the university was %100 English and all the students at this university had to certify their proficiency in English before they start studying at their department.

Moreover, to get a better understanding of pre-service teachers thought processes think-aloud sessions with three freshmen and two sophomore pre-service teachers from the same department were conducted. Pre-service teachers read each sentence/section of the Early Teacher Identity Measure and explained what they understood from the sentence/section in Turkish to establish cognitive validity (Karabenick, Woolley, Friedel, Ammon, Blazeovski, Bonney, De Groot, Gilbert, Musu, Kempler & Kelly, 2007). According to the results, all sentences were explained clearly and correctly by freshman and sophomore pre-service teachers from elementary mathematics education in METU. Therefore, it was inferred that ETIM was appropriate for the sample of the study (Appendix C).

3.2.2. Interview Schedule

To explore pre-service teachers' perspectives about the intervention, in-depth interviews planned, and semi-structured interview schedules were developed. After a comprehensive literature review and in line with the adopted theoretical framework of the study (Beijaard et al., 2000) the first draft of interviews was developed. Since the mother tongue of all participants is Turkish, the interview was prepared in Turkish. After the preparation of the interview schedule, three curriculum and instruction experts from two different universities are consulted. In line with the feedbacks, some questions were removed, and the wording of some questions was changed. The following question: 'bir öğretmenin iş tanımını nasıl açıklarsınız?' (How would you explain a teacher's job description?) transformed to that 'sence öğretmen kimdir?' (In your opinion, who is a teacher?). The question 'öğrenme hakkındaki görüşleriniz

gelecekte öğretim uygulamalarınızı nasıl etkileyecek?’ (How your views about learning will affect your teaching practices in the future?) was changed to ‘şu an bir üniversite öğrencisisin. Bir öğrenci olarak kendin için belirlediğin bir takım öğrenme yöntemlerin var. Sence bu yöntemler ileride senin öğretme yöntemlerine nasıl yansiyacak?’ (You are now a university student. As a student, you have several learning methods that you have determined for yourself. How do you think these methods will be reflected in your teaching methods in the future?) and the question ‘iyi bir öğretmenin karakteristik özellikleri nelerdir?’ (What are the characteristic features of a good teacher?) was rewritten as ‘sence iyi bir öğretmenin özellikleri nelerdir?’ (What are the qualifications of a good teacher?). Additionally, the following questions were removed from the schedule: (1) ‘what do you think being a teacher is composed of?’, (2) ‘what are some of the ways in which your own personal history has helped your teacher development?’, (3) ‘what are some of the ways in which your own personal history has hindered your development?’, (4) ‘there are so many factors that create teacher identity. Among them, 10 components of teacher identity were decided as race, gender, academic background, experiences along with schooling family, childhood games, teaching experiences with juniors, innate characteristic features, society, and emotions. Now, I want you to image teacher identity as a cake, can you order the size of pieces given below from the biggest to the smallest through explaining your reasoning?’.

After the necessary changes, a pilot interview with five first and second-grade pre-service elementary Mathematics teachers was conducted. In the pilot study, each student not only answered the question but also explained what they understood from the questions. It was observed that all the questions were understood clearly and correctly. The interview schedule was finalized.

The interview schedule (see Appendix D) was composed of two parts, the first part included demographic questions and the second part was composed of questions related to the categories such as the reasons behind the decision to be a teacher, beliefs and life experiences of pre-service teachers, pre-service teacher education, the culture of the university, teaching skills, emotions of pre-service teachers, teacher identity

formation process (Beijaard et al., 2000) and questions inquiring pre-service teachers' thoughts and experiences about the intervention program.

3.3. Data Collection Procedures

After the approval of the study was obtained from the Middle East Technical University (METU) Human Subjects Ethics Committee, the study was designed as part of a must course pre-service elementary math teachers take, Instructional Technology and Material Development Course. This course was composed of lectures and lab sessions. In the lectures, they learned educational technologies and the aesthetic of visual educational materials while in the lab sessions they learned about creating a blog page, effective usage of social media, photoshop, audio montage, and so on.

Pre-service teachers were contacted through Edmodo which is the world's largest K-12 social learning network (Get Edmodo, n.d.); they received prompts, announcements and they shared their blog addresses on this platform. The duration of the course was 14 weeks. In the first week of this time, the pre-service teachers were given a short introduction to the procedures of the intervention and provided with the informed consent forms. Pre-service teachers who agreed to participate were then given a demographic questionnaire asking about age, gender, and educational background and ETIM as a pre-test. In the second week, they were provided with a short presentation about how to do weekly online reflections and all of them created their blog pages and introduced themselves as their first published post in the lab session. Since the third week and throughout the following 10 weeks, pre-service teachers were provided with reflection prompts to guide their anticipatory reflective writings and they posted them on WordPress which is open-source software that you can use to create a website, blog, or application (WordPress, n.d.). For each reflective writing post, they had one week until publication after the prompt of the week was received on Edmodo. Since the intervention integrated into the course, reflective blog posts were given them as assignments, and for each reflective writing pre-service teachers got one point, in total intervention affected 10% of their course grade. For each late publication, they lost a point. In the last week of the course, ETIM has applied

to pre-service teachers again. Also, interviews were carried out with volunteer pre-service teachers individually.

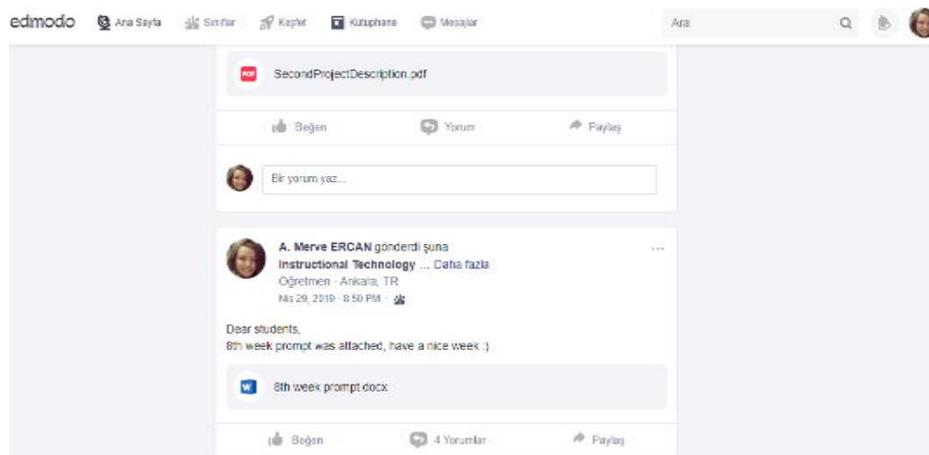


Figure 11 Edmodo Page Sample

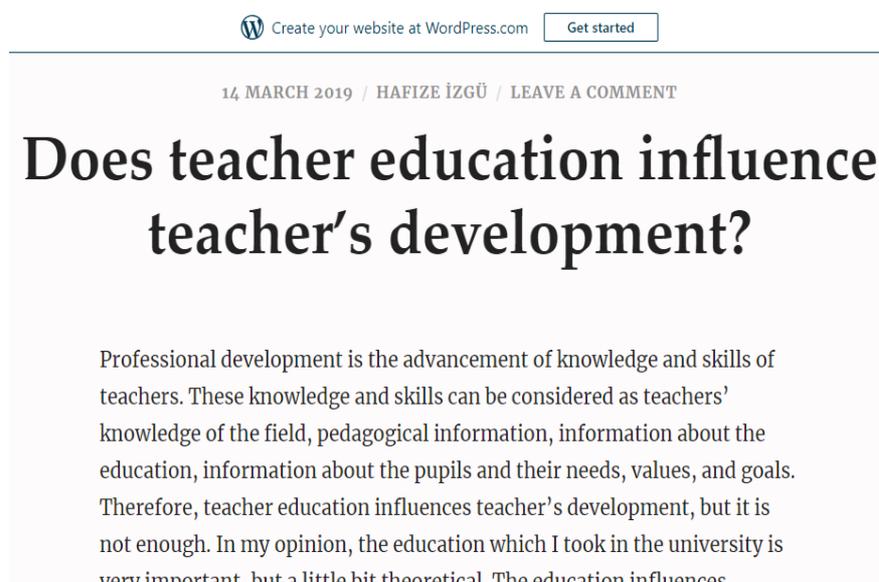


Figure 12 WordPress Page Sample

All prompts were composed of three parts: what, so what, and know what questions as seen in Appendix B. This model of the reflective questioning method was generated by Rolfe et al. (2001). 'What questions' are asked towards describing the experience in a detailed way, 'so what questions' were posed to express why the

experience was important, and ‘now what’ questions were asked to describe future steps of the experience. The prompts were based on the future students, their misconception, their possible expectations and needs, math learning methods, teaching strategies which could be applied in the future and the future conditions that pre-service math teachers will face. These bases made whole reflection anticipatory for pre-service teachers since they do not face any of them professionally and officially. However, the most futuristic part of the reflections was “now what questions” part. In ‘what’ and ‘so what’ parts, pre-service teachers might criticize their previous experiences of schooling in stead of directly thinking about the future; however, in ‘now what’ part they were structuring an idea about what could be done for the regarding topic from now on.

The topics of the prompts were based on the teacher identity framework (Beijaard et al., 2000) adopted in the study. According to the framework, there is three main expertise as subject matter expertise, pedagogical expertise, and didactical expertise, which are accepted as the fundamentals of teacher identity. Thus, the prompts were prepared under four main themes as subject matter expertise, pedagogical expertise, didactical expertise, and teacher professional development in general. Each prompt referred to one of these themes (Appendix A). In the first week, the prompt was prepared about professional teacher development in the pre-service stage. This prompt aimed to guide pre-service teachers think about ing what professional development is, which stages it has, how pre-service teacher education affects this development, what kind of concerns novice teachers can have. The prompts of the second week were about educational philosophy where pre-service teachers were guided to reflect on their educational philosophy. The same reflective writing assignment was repeated in the 10th week to enable pre-service teachers to realize the change in their educational philosophies if any. In the third week, they wrote about facilitating a love of math through pedagogical expertise. In the fourth week, they reflected their thoughts about how to teach math to elementary level pupils; in other words, they reflected on their didactical knowledge. In the fifth week, they received prompts about misconceptions, in this week they were guided to thin and express their thoughts about subject matter knowledge. In the sixth week, they reflected one more

time on their didactical expertise. In the seventh and eight weeks, pre-service teachers directed to think about the characteristics of their future pupils through the anticipatory reflective writings. The seventh week's prompt was on cultural diversity among the students and the requirements arising out of this diversity while in the eighth week they reflected on how to teach to future in the digital era considering the needs of digital natives. In the ninth week, the Holy Trinity developed by Maura Sellars (2017) was utilized to make pre-service teachers ponder about this trinity defined as to know yourself and how this self-knowledge impacts your professional self, know your content and how to teach it, and know your students and how they learn. This aimed to enable them to question how components construct the whole in terms of teacher identity. As mentioned earlier, last week they were prompted to write about their educational philosophy again.

At the end of the 10 week intervention, semi-structured interviews were conducted with seven pre-service teachers (5 female and 2 male) who volunteered to take part in the interviews. Semi-structured interviews lasted between 30 to 75 minutes. All the interview were recorded with participants' permissions.

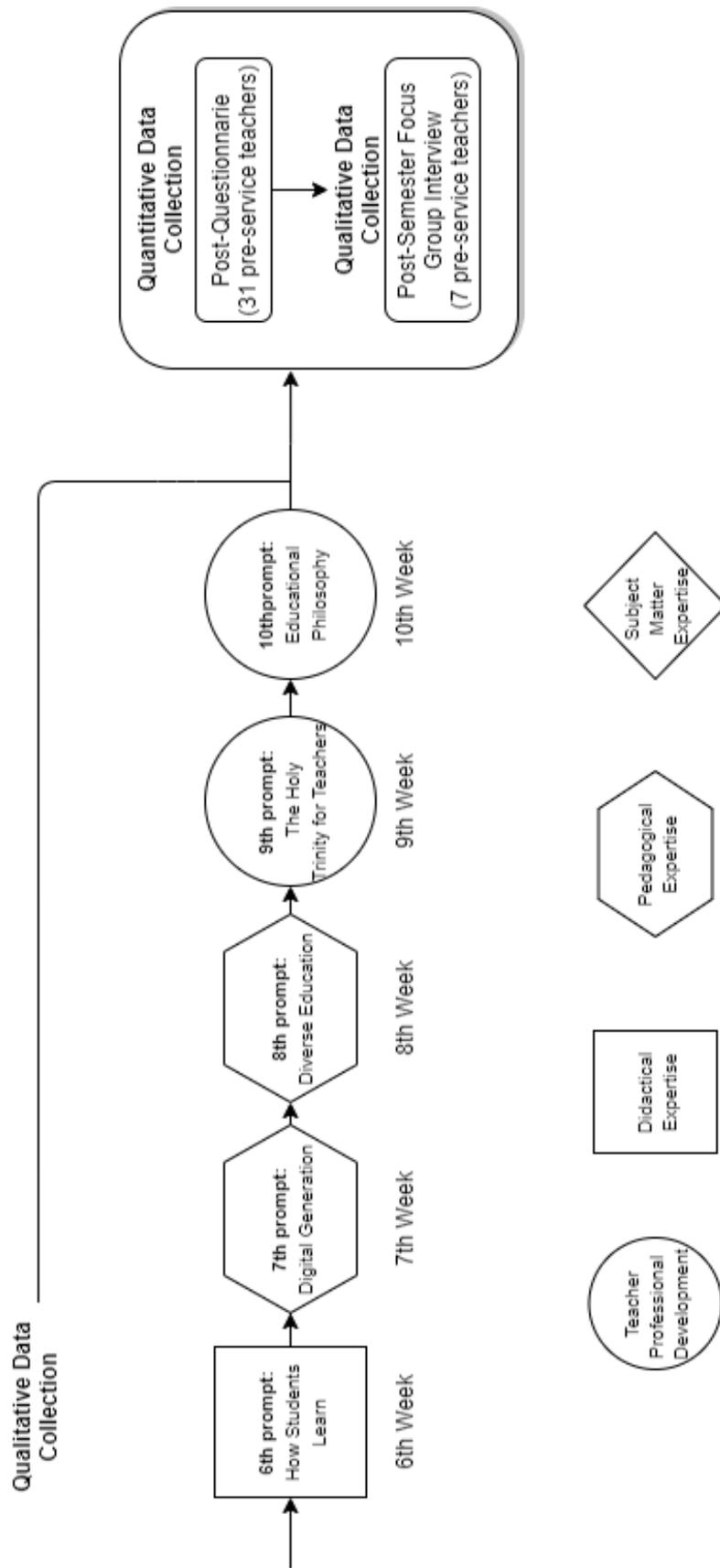


Figure 13. The Plan of the Intervention Program and Usage Order of Materials Flowchart

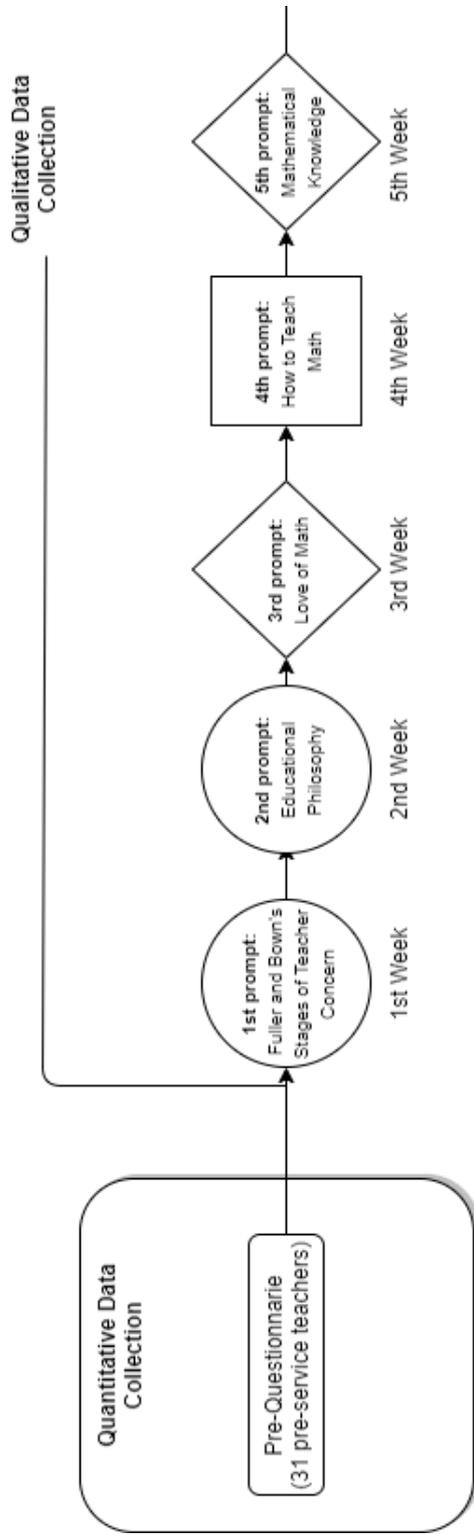


Figure 13 *The Plan of the Intervention Program and Usage Order of Materials Flowchart*

3.4. Data Analysis Procedures

3.4.1. Quantitative Data

First of all, the data collected from the participants who did not write reflections regularly were eliminated. The remained data (n=31) obtained from the scales were analyzed using the SPSS 24.0 statistical package program. The relevant categories of the measure were: “Strongly disagree (1)”, “Disagree (2)”, “Uncertain (3)”, “Agree (4)”, “Strongly agree (5)”. Negative items (1,3,7,10) were calculated inversely (Koca, 2016). The choices and boundaries of the scale were as follows: Strongly Disagree (1.00-1.80), Disagree (1.81-2.60), Uncertain (2.61-3.40), Agree (3.41-4.20), Strongly Agree (4.21-5.00).

A paired t-test was conducted in this study. Then the normality test was conducted to indicate whether the data of pre-service teachers demonstrated normal distribution. First, the Shapiro Wilk test was employed since the sample size is smaller than 50 (Ghasemi & Zahediasl, 2012); the Shapiro Wilk test verified that the data showed a normal distribution related to participating in online reflective writings and the teacher identity of pre-service teachers.

3.4.2. Qualitative Data

The data, obtained through the interviews were transcribed. To analyze the data, a thematic analysis approach was adopted and the stages developed by Braun and Clarke (2006) followed. Firstly to familiarize with data ‘repeated listening’ of the data was done to search for codes, patterns, and so on. The data was transcribed into written form. Initial codes emerged during the repeated listening in the first stage and the repeated reading after the transcription. Secondly, an initial codebook was prepared about what is in the data and how the coders interpreted them. Thirdly, codes were organized as meaningful themes. Fourthly, interpretative analysis of the themes was done through reviewing themes concerning the arguments which were examined in the research. In the fifth stage, the themes were named and listed. Lastly, the final analysis was conducted by looking for the essence, coherency, logic, and repetitiveness account of the data within and across themes, and the findings were reported.

When conducting thematic analysis the data is analyzed to identify repeating themes. There are different methods of conducting thematic analysis, in the first question, the deductive thematic analysis method is adopted as there is an overarching theoretical framework that the research was grounded in (Braun & Clarke, 2006). The Code Book (Appendix, E) was developed by following the framework of Beijaard et al. (2000) for the first question and by codes that emerged from data for the third question. Two different coders analyzed the same 20% of the data.

For the third research question, an inductive thematic approach was adopted (Braun & Clarke, 2006). Codes emerged from data during the coding process. To calculate the interrater reliability of the coding scheme, Krippendorff's alpha over 20% of the data was calculated. An alpha value of 0.89 was indicated and the rest of the data was coded by the researcher. Then second cycle code review was conducted to identify themes and two coders went over the themes together and any disagreements were solved through discussions (Braun & Clarke, 2006).

3.5. Limitations of the Study

This study had some limitations which needed to be reported. Firstly, in the gender structure of the study group, there was an unbalanced distribution depending on the gender distribution of the pre-service teachers studying in the elementary Mathematics education, and the majority of the participants were female teacher candidates. When interpreting the results, it should be taken into account that gender can be a confounding factor.

Secondly, in terms of the internal validity threats, mortality encountered although some provisions -mentioned in the study design part- were made. Pre-service teachers were expected to upload their reflective writings as weekly assignments and the order of the reflective writings and the posting regularly were important in terms of the design of the intervention. However, some students did not follow the deadlines of reflective writings or did not write all of them, thus their data could not be included in the study.

Thirdly, this study evaluates the teacher identity development of third grade pre-service elementary math teachers based on the intervention. Therefore, it is

important to evaluate professional development in this framework. The college year of pre-service teachers should be considered as a confounding factor because teacher candidates became closer to be a professional teacher. Both their social environment and themselves can attribute teacher role to these pre-service teachers more than the previous years and this can affect their identity development as a maturation threat. Additionally, there is no comparison group in one-group pretest-posttest quasi-experimental design and the convenience sampling method was utilized. Therefore, the selection treatment should be considered as another limitation of the study.

Lastly, in terms of external validity, the sample is restricted to the population of pre-service elementary math teachers studying at Middle East Technical University. Moreover, convenience sampling was conducted as the sample selection method instead of random sampling which could be a better way to represent the target population and to increase the generalizability of the results (Fraenkel & Wallen, 2006).

CHAPTER 4

RESULTS

In this chapter, the findings obtained from both quantitative and qualitative analysis were given and summarized.

4.1. Quantitative Analysis Results

The Early Teacher Identity Measurement includes 17 items clustered under three categories as follows: five items under self-categorization, six items under confidence/self-efficacy in becoming a teacher and six items under natural inclination towards children and teaching. However, in the original study conducted by The Early Teacher Identity measurement developers, a factor analysis conducted by Friesen and Besley (2013) revealed that all categories can be reduced under a single dimension named as 'teacher identity'. The average of all 17 items for the pre- and post-surveys were computed separately to obtain the 'teacher identity scale' of each participant before and after the intervention.

Shapiro-Wilks tests conducted on pre- ($SW(31) = .95, p > .05$) and post-intervention ($SW(31) = .96, p > .05$) scores did not detect a significant deviation from normality. Since the main hypotheses expected a significant increase after the intervention, one-tailed paired samples t-test was used. An alpha level 0.05 was adopted.

Table 3

Normality test results for the subdimensions of Teacher Identity Scale

	Tests of Normality		
	Shapiro-Wilk		
	Statistic	df	p
Pre Test Total	0.95	31	0.14
Post Test Total	0.96	31	0.31

A

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

paired-samples t-test conducted on pre- and post-intervention teacher identity scale scores showed that the post-intervention scores were significantly higher than the pre-intervention scores ($MD=-3.36$, $SD=7.55$), $t(30)=-2.47$, $p<.05$, $d=.33$ (Figure 14).

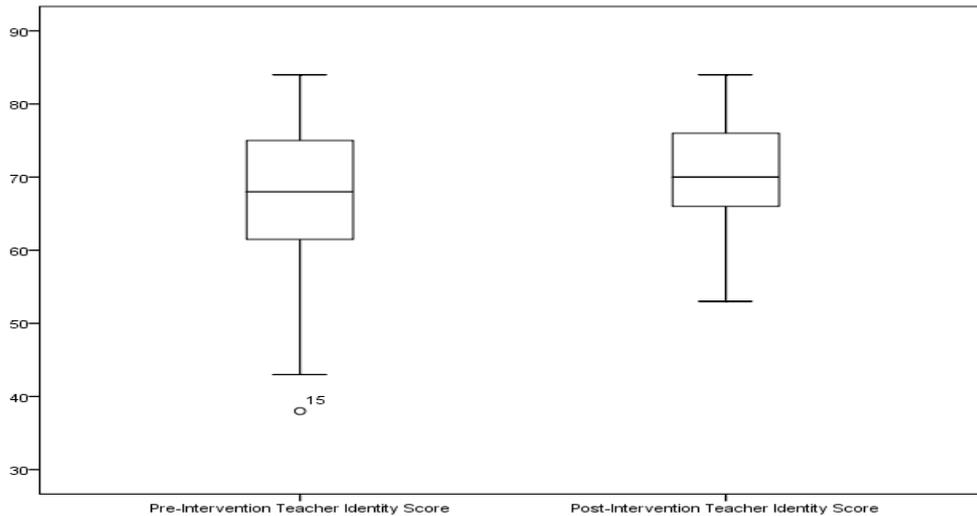
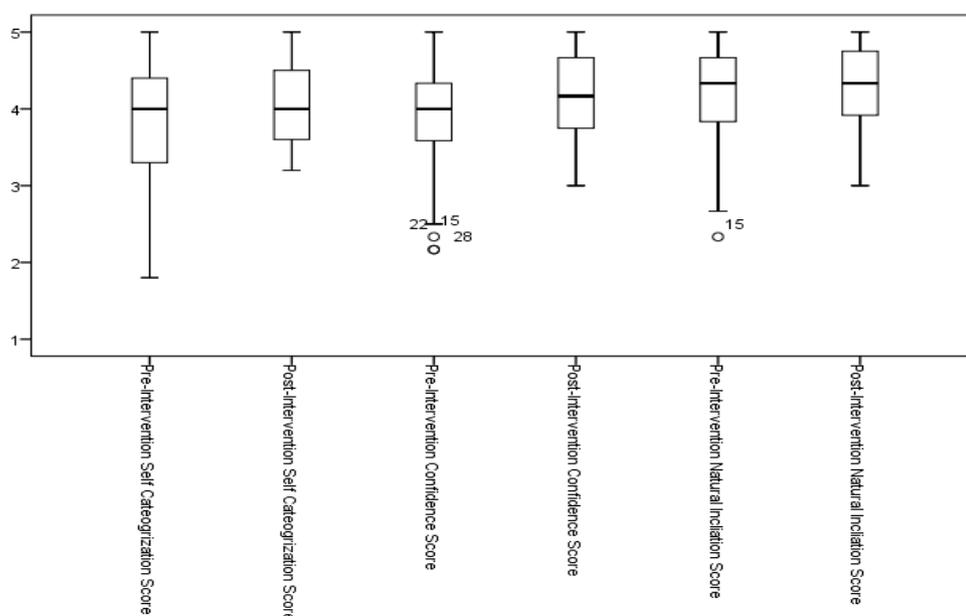


Figure 14 *Average Teacher Identity Scale Scores Observed Before and After the Intervention*

Table 5 below summarizes the results of Shapiro-Wilk normality tests conducted for the subdimensions of the Teacher Identity Scale. Although there are slight violations, together with the approximately symmetric distributions obtained in the boxplots (Figure 15), one-tailed paired t-tests were used to compare pre- and post-intervention scores for each sub-dimension.

Table 4*Normality Test Results for the Subdimensions of Teacher Identity Scale*

	Tests of Normality		
	Shapiro-Wilk		
	Statistic	df	p
Pre-Intervention Self Categorization Score	.95	31	.18
Pre-Intervention Confidence Score	.92	31	.03
A Pre-Intervention Natural Inclination Towards Children & Teaching Score	.89	31	.00
Post-Intervention Self Cateogrization Score	.92	31	.02
Post-Intervention Confidence Score	.93	31	.03
Post-Intervention Natural Inclination Towards Children & Teaching Score	.13	31	.20*

**Figure 15** *Boxplots showing the Distribution of Pre-Intervention and Post-Intervention Scores for the Self-Categorization, Participation and Confidence Dimensions.*

According to one-tailed paired t-tests results (Table 6), it was find that the post-intervention score was significantly higher than the pre-intervention score for the self-categorization ($MD=-0.22$, $SD=.62$, $t(30)=-1.96$, $p<.05$, $d=.30$) and confidence/self-

efficacy dimensions ($MD=-0.26$, $SD=.81$, $t(30)=-1.77$, $p<.05$, $d=.35$). No significant difference was observed for the natural inclination towards children and teaching dimension ($MD=-0.12$, $SD=.54$, $t(30)=-1.22$, $p>.05$).

Table 5

Results of Dependent T-Test Conducted for the Three Subdimensions of Teacher Identity

		Mean	SD	SEM	t	Df	P
Pair 1	Pre-Intervention Self Categorization Score - Post-Intervention Self Categorization Score	-0.22	0.62	0.11	-1.96	30	0.06
Pair 2	Pre-Intervention Confidence Score - Post-Intervention Confidence Score	-0.26	0.81	0.15	-1.78	30	0.09
Pair 3	Pre-Intervention Natural Inclination Score - Post-Intervention Natural Inclination Score	-0.12	0.54	0.10	-1.23	30	0.23

4.2. Qualitative Data Results

Semi-structured interviews were utilized to follow up the quantitative data. Data were analyzed for the first and the third research questions through a thematic analysis approach to get an in-depth understanding of pre-service teachers' perceptions about their identity development process and the intervention. The main themes were determined at the latent level which means coding was done by looking at the ideas, assumptions, and conceptualisations -ideologies- about teacher identity and the intervention.

In the first research question, how pre-service teachers see themselves as teachers were examined. Data coding was done based on the teacher identity framework developed by Beijaard et al. (2000). Since the codes were indicated through a pre-existing framework, theoretical (deductive) thematic coding was conducted. According to the utilized framework, teacher identity development has three fundamental dimensions: pedagogical expertise, didactical expertise and subject matter expertise. The codes of the analysis were indicated as these fundamentals. Coding was done by attributing participants' sentences to one of these fundamental dimensions of teacher identity.

In the third research question, two main themes emerged from the data. These themes were as followings;

- a) The pre-service teachers' perceptions about the affordances of the intervention for teacher identity development.

Under this theme, the effects of the intervention on pre-service teachers' professional development were handled. According to pre-service teachers, the intervention promoted their professional development by affording some benefits. The code list of the mentioned affordances was given with descriptions in Appendix E.

- b) The pre-service teachers' feedbacks about the intervention.

Under this theme, pre-service teachers' feedbacks about the intervention were presented. Code list of the preservice teachers' opinions was given with code descriptions in Appendix E.

4.2.1. How Pre-Service Teachers See Themselves as a Teacher

The first theme was about how pre-service teachers perceive themselves as a teacher. According to the analysis of data, all pre-service teachers believe that they will be good and efficient teachers in the future. They mostly referred to didactical and pedagogical expertise compared to subject matter expertise when they describe the factors and skills that will make them a good teacher.

Pedagogical Expertise Pedagogical expertise was the first requirement that came to the mind of the majority of pre-service teachers when they talked about the ‘good teacher’. Most pre-service teachers believed that the first skill every teacher should gain to be a good teacher is communication skills. However, they framed the nature of communication as communication with students and did not mention communication with parents or colleagues as part of being a good teacher.

“Öncelikle, iletişimi çok kuvvetli olmalı” (P2) *“First of all, (s/he) should have strong communication skills” (P2)*

“İyi bir öğretmen denilince akla ilk başta iyi bir iletişim kurabilen geliyor aklıma yani çünkü öğretmen kelimesinin kökeninde bildiğini öğretmek yattığı için, bildiğini öğretmek için iyi bir ‘communicator’ olması lazım. Yani, iyi iletişime sahip olan bir insan olması lazım.” (P4) *“When you say a good teacher, someone who can communicate well comes first to my mind. Because “teaching what you knew” is the underlying meaning of the word “teacher”, to teach what you know you should be a good communicator. So, he/she should be someone who is a great communicator.” (P4)*

This nature of the teacher-student relationship was very important for pre-service teachers understanding of effective teacher. Their emphasis was on knowing the students in the classroom and acting with a balance of discipline and guidance. In terms of their teacher identity, this pedagogical strategy to know the students and adjust teaching regarding their interest, motivation and backgrounds was often reflected in the interviews.

“İkinci olarak da öğrenciyi çok iyi tanımalı ki ona göre hani ona bir şey vermeli diye düşünüyorum.” (P2) *“Secondly, I think that the teacher should know the student very well so that s/he could teach him something.” (P2)*

“Bence iyi bir öğretmen öğrencilerini tanımalı en başta.” (P6) *“To me, a good teacher should know his/her students first.” (P6)*

“Öğrencileriyle arkadaş değil ama arkadaş gibi bir tavrda olmalı.” (P6) *“Teacher should not be a friend of students but should be friendly.” (P6)*

“İkinci olarak öğrencilerine karşı samimi, içten olması lazım. Nedir peki bu samimiyet içtenlik? Hani, benim kasetettiğim samimiyet, içtenlikte disiplini engelleyecek herhangi bir faktör söz konusu değil. Disiplinli olabildiği gibi samimi ve içten de olabilir bir öğretmen. Çünkü, öğrencisi o öğretmenin disiplinin aslında ona samimiyetinden geldiğini fark edecektir bu sayede.” (P4) *“Secondly, the teacher should be sincere with his/her students. What does this sincerity mean? What I mean by sincere, sincerity is not a factor to obstruct discipline. The teacher could be sincere and disciplined as well as. That is because the student will notice that this authority is stemmed from this sincerity the teacher has.” (P4)*

“Eh... Neyi yapmaz konusunda da böyle belli bir katı kuralları olan ve her öğrenciye aynı taktiklerle yaklaşmasının yanlış olduğunu düşünüyorum.” (P2) *“Ehm...about what would not s/he does, I think it is wrong to have strict rules about things and approach every student with the same tactics.” (P2)*

Finally, under this theme pre-service teachers reflected that although they had some reservation about the pedagogical dimension of their teacher identity, yet, in general, they mentioned that they felt competent as they had a quality teacher education.

“kendimi yeterli görmediğim noktalar var pedagojik gelişimimde de... Ama şey tabi büyük çaplı olaylar... Uhm... Ne bileyim bazen şeyler olur ya öğrencilerin aile ortamında yaşadığı büyük sıkıntılar var onu sen... Görmen gerekir falan, o konularla ilgili böyle biraz çekinceler duyuyorum.” (P5) *“There are some points I do not think competent enough in terms of pedagogy... But the like big issues... Uhm... I am not sure but sometimes you have to see the problems of students... the problems of the students that they have in their family. I have some reservations about such issues.” (P5)*

“Pedagojik bilgi olarak bence yeterli bir eğitim aldık. Güzel bir eğitim aldık. Ama daha çok hani öğrencilerle beraber olmam gerekiyor benim, biraz daha kendimi hazır hissetmem için çünkü hani alan bilgimin yeterli olduğunu düşünüyorum pedagojik de okey ama yani uhm... Bunlar sadece öğrenciye iyi bir şey. Uhm... İyi bir şekilde öğretmek için yeterli değil bence. *“We received sufficient education regarding pedagogy. We had a good quality of education. But I should be with the students to feel comfortable since I believe I am sufficient regarding my subject matter knowledge and I am also okay pedagogically but Uhm... These are just good for students.... Uhm... They are not enough for*

Öğrencinin nasıl bir zeka çeşidine daha uygun... nasıl bir... Hani nasıl öğreniyor çocuk? Bunu bilmek çok önemli. Ya tabi temelini bilmek çok önemli, alt yapısını öğrenmek çok önemli, bunlar da tabi tecrübeyle gelişecek şeyler bence. "(P6)

teaching well. What kind of intelligence that students have... How like... How does a kid learn? It is very important to know. Of course, it is important to know the basis of these, these are things that will develop with experience." (P6)

In terms of pedagogical expertise as a dimension of teacher identity, pre-service teachers only focused on student-teacher relationship and teachers' knowledge about their students but lacked other aspects of pedagogical expertise.

Didactical Expertise In the reflective interviews, the other most attributed expertise as a dimension of teacher identity was didactical expertise. In their responses, pre-service teachers generally focused on topics such as learning and knowing how to teach better, their educational philosophy, and role as a teacher. The didactic expertise reflected in pre-service teachers' responses were mainly about teaching strategies they would adopt in the classroom to ease students learning process and mainly focused on the importance of facilitating hands-on learning in teaching.

"...işte yaparak yaşayarak öğrenme giriyor mu buna yani, dediğim gibi yine çok klişe olacak ama işte öğrencilerin deneyimleyerek öğrenmeleri gerek... Matematik çok soyut bir kavram tabi ki. Ama bunu olabildiğince işte farklı duyularına, dokunarak fark etmelerini, daha iyi öğrenmelerini sağlamaya çalışırım." (P4)

"...So, is learning while doing and experiencing also included in this, I mean, as I said, it will be cliché but leading students to learn through experience is necessary... Of course, math is a very abstract concept. But I try to make them learn better by touching their various senses and make them realize." (P4)

"Ya ilköğretim çocukları için biraz daha böyle eğlenceye yönelik şeyler yapıldığında onları daha fazla derste tutabiliriz diye düşünüyorum. Mesela her oyun için değişik etkinlikler ve aktiviteler ya da oyunlar tasarlamak onların anlamasını inanılmaz kolaylaştırır. Eh... Ve başka, bir de şeyi seviyorum konuların en temelini öğrenmeyi ve birilerine anlatmayı sevdiğim için ilköğretim seviyesinde o yeterli." (P3)

"Well for the elementary school students, I believe we keep their attention when we do more entertainment. For example, different activities and events for each game or designing games will ease their learning unbelievably. Eh... And then, also I like since I like learning the most fundamental parts of the topic and explaining to others that are also enough at the elementary school level." (P3)

"Mesela atıyorum kümeler konusu var ben bunu öğrenciye şu şekilde anlatacağım gibi değil de şu şekilde

"For example, the topic of clusters, it is not like I explain this to the student like that but I like doing like this more, for

yapmayı daha çok seviyorum, mesela A kişisi bunu şu şekilde anlatırsam sever B kişisi mesela şu şekilde anlatırsam daha çok eğlenir daha çok anlar gibi... Yani bir konu üzerinden farklı anlatım tekniklerini düşünmeyi seviyorum.” (P4)

example, person A likes if I explain it this way and person B enjoys and learns more in that way... I mean, I like thinking about various ways of explaining a subject.” (P4)

In terms of didactical expertise, pre-service teachers were mainly satisfied with their teacher education, however, they also reflected their concerns about not being competent enough in the classroom to facilitate student learning. They perceived didactical expertise as an instrument which helps them adjust their teaching strategies in line with the needs and level of their students and accept that it is still an ongoing process.

“O da şöyle, birçok tekniği biliyorum yani nasıl yaklaşmam gerektiğini hangi durumlarda neler yapmam gerektiğini biliyorum ama şu noktada da hayır; henüz daha staj yapmadık method dersini (matematik öğretim metodları) de almadım. Eh, bu noktada da bir konuyu öğrenciye nasıl anlatmam gerektiği konusunda kafamda hala bir şeyler netleşmiş değil.” (P5)

A “that is I know many tactics, I mean how to approach, what to do in which cases but at that point no; we haven't completed our internship and I did not take the methods course (maths teaching methods) either. Ehm, at this point it is not clear in my mind how to explain a topic to a student.” (P5)

‘Yani tekniğimle alakalı daha çok. Hani çocuklara ulaşamazsam onlara ulaşamazsam diye. Az önce de söylemişim yani ben öğrenme... Kendi öğrenme yöntemimle anlatmaya çalışırım ve onlara hiç uymaz mesela sınıfta bir kişiye bile uymayabilir. O zaman şey olurum, yani böyle o zaman yetersiz hissedirim işte, o zaman yetersiz bir öğretmen gibi görürüm kendimi.’ (P6)

“Well, it is more about my technique. I mean if I could not reach the kids. I said just before I mean I learn... I try to explain with my learning method, and this might not be an appeal to them (students), not even a single one. And then I will be like, I mean I feel insufficient, then I would see myself as an inadequate teacher.” (P6)

The response of pre-service teachers mirrored their understanding of didactical expertise as a foundational dimension of their teacher identity that encompasses mainly teaching strategies rather than reflecting the teaching and learning process as a whole.

Subject Matter Expertise The least frequently mentioned expertise was the subject matter expertise in pre-service teachers responds. Even if it was not mirrored as frequently as pedagogical and didactical expertise, in terms of how they mirrored their understanding of teacher identity, it was clear from pre-service teachers' interviews that according to them is a subject matter expert was essential. Pre-service teachers stated that a teacher cannot know how to teach before knowing what to teach and that a qualified teacher should be an authority in her/his discipline.

“Siz a’yı öğretmek istiyorsanız öncelikle alfabeye hakim olmalısınız. Ve a, b sizin için bir başlangıç olmalı. Başkasının başlangıcı, aslında sizin öğreteceğiniz şeyin temelini oluşturuyor. Bir başkasının başlangıcı, ama siz nesiniz, öğretmensiniz ve alfabeye hakimsiniz. Bence işte bundan kaynaklı olarak da son iki yıldır aldığım bütün matematik derslerine bakışımı değiştirdim ve elimden geldiği kadar anlamaya ve öğrenmeye çalıştım. Çünkü ben bir Calculus’u çocuğa öğretmeyeceksem de, çocuğun içindeki yer alan matematiğin hazzıyla... o çocuğun anlaması gereken ve o çocuğa öğretmem gereken konuyu daha da içselleştiriyorum.” (P4)

“If you want to teach the letter you should first have a good command of the alphabet. And a and b should be starting points for you. Other’s starting point becomes the foundation of the things you will teach. The starting point of others, but what are you? you are the teacher, and you know the alphabet. I believe because of this I changed my perspective for all the Mathematics courses I took and tried my best to learn and understand for the last two years. Because even if I am not going to teach Calculus to a student, with the love of the math inside the kid... I internalize the topics that I should teach the kid and that I should enable her/him understand.” (P4)

“... üçüncü olarak tabii ki de, alanında yetkin... Yani çünkü bildiği bilgiyi öğretecek insan olduğu için, bildiği bilgiyi doğru ve eh, olabildiğince çok bilmesi gerekiyor. İyi bir öğretmen deyince aklıma gelen ilk temel üçlü bunlar.” (P1)

“... and thirdly, of course, being competent in their profession... Since s/he is the person to teach, s/he has to know her/his area of expertise as much and as correctly as possible. These are the essential trio that comes to my mind when a good teacher is concerned.” (P1)

“Diğer basamak tabiki de, akademik olarak yetkin olmalı kendi şeyinde, basic bir bilgi birikimi olmalı ve o basic bilgi birikimini kendini geliştirebilecek şekilde araştırma yapmayı bilmesi gerekiyor.” (P5)

“Another step is, of course, being competent in his/her subject matter area, s/he should have a basic knowledge about that area and should know how to research to develop himself/herself with it.” (P5)

Participant pre-service teachers seemed to think subject matter knowledge is important for being a qualified teacher as reflected in their responses. Specifically, they focused on the importance of being aware of the misconceptions in teaching Mathematics and their competence in dealing with them in a teaching and learning context.

“Benim en çok hoşuma giden şey öğrencilerin bu kavram yanlışlarını tartışmak ve onlar üzerine yorumda bulunmak.” (P4)

“My favourite thing is to discuss the conceptual mistakes students make and comment over them.” (P4)

“Öğrencilerin verebileceği olası cevaplar, işte olası yanlış anlaşılmalara, falan gibi kısımlar vardı (kavram yanlışlığı üzerine yazılan yansıtıcı yazı hakkında konuşuyoruz). Onları derse gitmeden düşünürsem daha kendinden emin daha işte mesela bir yanlış anlaşılmayı (kavram yanlışlığını) düzeltirken yeni yanlışlar... yanlış anlaşılmalara (kavram yanlışlığını) yer vermeyecek şekilde cevaplar oluşturabilirim gibi düşünüyorum.” (P1)

“There were parts like the possible answers, possible misconceptions that students could have (talking about the reflective writing prompt about misconceptions). If I think about these possibilities before the class then I could be more self-confident, less likely to cause new misconceptions, new mistakes (misconceptions)... I could generate answers that won't lead to such misunderstandings.” (P1)

“Doğal sayılarda, üç dörtten küçük bir sayı olduğu için, haliyle çocuk doğal sayılardan kesirlere geçince, var olan ön bilgisinin kullanarak, diyor ki bir bölü dört bir bölü üçten daha büyüktür diyor. Şimdi böyle bir şeyle karşılaştığım zaman sınıf ortamında, arkadaşlarımdan bunun üzerine yorum yapması, benim bunu öğrenmem, benim bunun üzerine yorum yapmam ve bu misconception'ları nasıl çözebiliriz üzerine tartışmak bana çok şey kattı bu sene.” (P4)

“In natural numbers, since three is a smaller number than four, naturally a kid will think that one over four is greater than one over three in fractional numbers. When I face with such a thing, comments of my friends in the classroom (during the teacher education), my learning about this, and my comment over that, and discussing the solutions of such misconceptions contributed to me too much this year.” (P4)

In general, pre-service teachers saw themselves as subject matter experts to certain aspect and their understanding of it was reflected concerning a deep understanding of domain-specific knowledge.

4.2.2. Affordances of the Intervention for Teacher Identity Development

The second theme of the analysis was about the perceived affordances of the intervention that showed how it facilitated pre-service teachers' professional identity development. The thematic analysis was conducted mainly to strive to understand how the intervention worked in practice and to this end, the analysis elaborated on insights gained from pre-service teachers' responses. Students talked about how the intervention facilitated thinking, awareness, perception, and enabled them to internalize their teacher identity.

Intervention Facilitated Thinking According to pre-service teachers' perception, one of the most important affordances of the anticipatory reflections was that the writing process facilitated their thinking on professional skills which includes thinking about themselves as a teacher, thinking about their educational philosophies, thinking about different perspectives of teaching environment they might face when they start teaching, thinking about education-related topics they had never paid attention before.

“Gerçekten daha önce hiç düşünmediğim şeyleri düşündüm işte mesela işte ‘Sınıfınızda farklı kültürlerden öğrenciler olursa ne yaparsınız?’ gibi bir şey mesela, o güne kadar onu hiç düşünmemiş olabilirim. Bazı haftalarda, hatta çoğu haftalarda böyle şeylerle karşılaştım.” (P1)

“I thought about the things that I had never thought before. For example, something like ‘What will you do if there are students from other cultures?’, I might have never thought about that until that day. In some weeks, in fact, in most of the weeks, I encountered such stuff. (P1).

“Yani bilmiyorum bence faydalı oldu bu yani çünkü düşünmemi sağladı o konuda mesela şu zaman kadar hiç düşünmemiştim. Hep şöyle öğretim, böyle öğretim; şöyle davranırım, böyle davranırım. Ama dediğim gibi, bence faydası oldu yani bu konuda.” (P3)

“Well I don’t know, I think it was beneficial since it made me think about that topic, for example, I have never thought about it until this time. It was always like, I teach like this, like that, behave like this, like that... But as I said, I think it was beneficial in this sense.” (P3)

Most of the students stated that the intervention allowed them to contemplate their educational philosophies and be self-reflective about their beliefs and opinions.

“Ya ben hiç...kendi eğitim felsefem...Atıyorum bir konu üzerinden gidelim, eğitim felsefesi, hiç üzerine bu kadar düşünmemiştim. Hani, bu kadar böyle farklı yönlerde düşünmemiştim yani genelde bloglarda beş soru, altı soru oluyor ve hepsi farklı yönlerden ele alıyor. O yüzden, mesela ben reflection kısmını çok sevdim hatta her hafta eğlenerek yaptım öyle söyleyeyim.” (P2)

“Well, I never... my education philosophy... Let's continue with a subject, education philosophy, I have never thought about it that much. I mean, I did not think about it from different perspectives, I mean usually, blogs have five or six questions each approaching the topic from different directions. Therefore, for example, I like the reflection part I did them each week with joy.” (P2)

“...o konu hakkında mutlaka düşünüyorsun mesela eğitim felsefem nedir diye düşünüyorum ben oturup bir o prompt'ta bir yarım saat düşündüm hani benim eğitim felsefem ne hani kendimi iyice bir sorgulayıp işte tartıp, biçip, hani ölçüp ona göre yazdım. Tabi ki kendin hakkında bir bilgi sahibi olmanı sağlıyor kendini dönüyorsun biraz daha ve hani en azından konu üzerine biraz daha düşünüyorsun. Bu açıdan iyiydi. Aynen, bu açılardan faydalıydı.” (P6)

“...you are thinking about that topic, for example, I sat and think about what is my educational philosophy, I thought about that prompt for half an hour, I mean 'What is my educational philosophy?' questioning it deeply, evaluating myself then I wrote down. For sure it makes you learn about yourself. You turn to yourself and think about the topic a bit more. It was nice from this perspective. Yeah, it was beneficial from this perspective.” (P6)

They reported how they realized the importance of forming their ideas and how reflective writing promoted thinking. They noted while they are writing and thinking, they negotiated with themselves and form/shape their ideas.

“Yani işte yazılmadan düşünül-müyormuş. Onu fark ettim. Sadece düşünseydik mesela o da yetersizdi yazmak gerçekten kuvvetli bir şey. Yazarken kendimi bazı konularda ikna ettiğim ya da yazarken ‘Yok ya, aslında bu böyle değil.’ diye seçimlerimden vazgeçtiğim anlar oldu.” (P1)

“So, I figured out that it is not possible to think without writing. For example, if we would just think, then it would also be insufficient. Writing is something powerful. While writing, I convinced myself about certain topics or I had moments when I said ‘Nope, it is not like that’ and changed my choices.” (P1)

“...ben bir başkasının bankası olmak istemiyorum, ya ben işte X Hoca şu fikri savunuyor; işte Y hoca şu fikri savunuyor gibi konuşmaktan ziyade, benim fikrim bu, benim fikrim şu diye konuşmam gerektiği için de, bildiğim bilgiyi kendimce düşünerek, işlemem

“... I don't want to be somebody's bank. Well, rather than saying teacher X is defending this argument, teacher Y is defending that argument, I want to say this is my opinions because I need to talk like this is my opinion, it is a necessity for me to process my knowledge by

gerekiyor ve reflectionlar bana bunu sağladı.” (P4) *thinking and reflections provided me with this opportunity.” (P4)*

Intervention Facilitated Awareness The main difference between facilitating thinking and awareness themes was that under the facilitating awareness coding, teachers indicated that they reached out a conclusion or an illumination at the end of the thinking process. Thinking in this sense is categorized as an affordance of the intervention which prompted pre-service teachers to question and come with some thoughts, while awareness is when they observed themselves thinking, questioning and finding some answers, understanding their own behaviours and senses better. Interview analysis indicated that the intervention facilitated awareness in pre-service teachers about themselves as a teacher, their ideas and some teaching-related topics.

Pre-service teachers stated the positive effects of reflective writing on their self-awareness and professional awareness at the same time. For example, the following excerpts exemplified some personal awareness pre-service teachers went through and become more self-aware regarding themselves as a teacher. In the first one pre-service teacher mentioned how s/he realized why it was so difficult for her/him to learn Mathematics when s/he was young and the following ones exemplified how they became more aware of their strengths and weakness.

“Sadece kendimde hani bazı şeyleri mesela matematiği neden ilk başta öğrenemediğimizin cevabını buldum hani evet dedim benim için çok karmaşıkmiş matematik çünkü hocalar... o kadar karmaşık geliyordu ki, bir de yeni bir şey görüyorsunuz. Diyorsun ki bu nasıl bir şey, hani oyun çağı bir de ister istemez. Onu fark ettim.” (P3) *“ Only in myself, like, some things, for example, I found the answer to why we could not learn mathematics in the first place as you know, I said yes, for me, math was very complex because those teachers... seemed too complex, also you see something new. And you say, what kind of a thing is this, like, that happened during the play age you know. I noticed that.” (P3)*

“Öğretmen açısından da aslında dediğim gibi kendini tanıma ve ne istediğine karar verme açısından yararlı.” (P6) *“As I said, from a teacher's perspective it (reflective writings) is also beneficial for knowing yourself and deciding what you want.” (P6)*

“öğretmen kimliğimizi geliştirdiğini düşünüyorum. Yani en azından şöyle *“Exactly, I think it improved our teacher identity. I mean, at least, it*

bir farkındalık yarattırdı; kendimi biraz daha iyi tanıyıp ne istediğimi bilmemi sağladı diyebilirim. Ya da işte hani ben kimim yani benim eğitim felsefem ne, ben nasıl bir eğitim vereceğim? Veya ne bileyim matematik sevgisi nasıl olur? Çocuğa nasıl aşılarsın bunu gibi, en azından konu üzerinde düşündüğümüz için biraz daha hani bu açıdan bizi geliştirdiğini düşünüyorum.” (P4)

created awareness as it made me know myself better and understand what I want. Or like “Who am I?” I mean “What is my educational philosophy?”, “What kind of instruction am I going to deliver?” or like “What is the love of mathematics like?”, “How can you make children love Maths?”. Because as we thought about the topic, I believe it developed us in that perspective.” (P4)

“Mesela işte şeyi gördüm diyelim bu haftanın konusunu... Şöyle bir baktım işte sorulara falan... Yani hiç ilgimi çekmedi. Sonra işte bana bir şey katacak mı gibisinden hiç düşünmedim yani, bunu yapmalıyım gibisinden düşündüm ama işte araştırmayı yaptıktan sonra da bir şeylerin yani bende eksik olduğunu fark ettim mesela o konuyla ilgili.” (P7)

“For example, let’s say I saw the topic of this week... I looked over the questions and so... I mean, it did not attract my interest. Then well I did not think about if it contributes something to me. I mean, I think that like I should do it but then after research, I realized that I am missing something about that topic.” (P7)

Besides personal awareness, the data analysis showed that pre-service teachers’ reported awareness about what is important for students in terms of teaching and learning Mathematics, thus created awareness in relation to their math teacher identity through facilitating their professional awareness.

“Eh, mesela ben sadece yani belki hatırlarsınız dönemin başında şey olarak düşünüyordum işte iletişim, çok önemli bir de eh... Öğretim metotları çok önemli falan diyordum. Bu bloglardan sonra şeyi fark ettim, öğrencinin aslında en çok ihtiyacı olan şey kendini gerçekleştirmek mesela bloglarda yazarken falan mesela bunu fark ettim. Ve şimdi mesela öğretim yöntemim biraz şekillenmeye başladı bunlarla birlikte.” (P2)

“Ehm, for example, I was just, maybe you also remember, at the beginning of the term I was thinking like communication is very important and I was saying teaching methods are very important and so on. After these blogs, I realized that the most important thing that a student needs is self-actualization. For example, while writing blogs I realized that. And now, for example, my teaching methods started to get in line with it.” (P2)

“Şöyle bir şey var, ben birçok şeyi hani orada fark ettim. Yani, baktığım zaman çünkü hemen oturup yazayım değildim ben; bi bakarım ilk geldiği gün zaten ne varmış

“And the thing is, I figured out most of the things there. I mean, when I looked, I was not a sit and write person, I first look and see what is

diye. Onun üzerine ister istemez zaten bir yerde aklıma gelir ne bileyim bir sigara içerken ya da bir şey yaparken hani, otururken kitap okurken elbette aklıma geliyor. Ben şunu fark ettim uhm... Ya biliyorum mesela ben birçok şeyi fark etmemişim mesela neyi yapamadığımı neden şey yapmadığımı... Ben bunları sonraya bıraktım mesela. O anda belki bunu fark ettim ama adını koyamadım. Ama sizin sorduğunuz sorularla ben onun adını tam koyabildim yani. Evet ya, bunun sebebi, buymuş yani bu şekilde hani nasıl diyeyim...” (P3)

there. Then inevitably, something comes to my mind at someplace, while smoking or doing something else. I meanwhile sitting and reading a book, it comes to my mind. I realized that for example, I did not realize what I did not do and why I did not do the thing... I left them for later for example. Maybe I realized this at that time but could not name it. But with the questions, you asked I could name it precisely. Well yes, the cause of that was this, I mean like this how could I say...” (P3)

Moreover, their responses concerning their increased awareness about issues related to mathematics teaching and learning extend to some key aspects of it such as mediating mathematics education in culturally diverse classrooms. Pre-service teachers mentioned that became aware of the cultural diversity and its importance.

“Mesela daha önce ‘cultural responsive environment’ falan çok şey hani, tamam bir şeye dikkat etmemiz gerekiyor, nasıl dikkat etmem gerekiyor? Buna cevap veremezdim Bu telafi etmek için okumalara falan baktım... Düşündüm hani ben, bu dönemin başında bunları cevaplayamazdım, bu dönemin sonunda bunları cevaplıyorum böyle, ilginç geldi.” (P5)

“For example, before, I was like a culturally responsive environment, okay, we should be careful about somethings, but how am I supposed to do that? I was not able to answer that. To compensate for this, I looked for articles... I thought, like, at the beginning of this term, I could not answer these, at the end of this term, I can, like, I find this interesting.” (P5)

“Halbuki hep konuştuğumuz bir konu (kültürel farklılıklar) ama ben hani kendi, kişisel olarak önemli olmadığı için demek bende, hayatımda bununla ilgili bir şey yaşamadığım için, hiç aklıma gelmemişti veya işte hepimiz insanız öğretiriz ya öğreniriz ya gibi bir gevşeklik ve rahatlıktaydım ama arkadaşımın kültür farklılığı yorumundan sonra, yani kültür demek herşey demek. dilden, dinden yani her şey demek. Öğrencilerin algılayış açılarının farklı olacağını gördüm. o anlamda farklı olacak o yüzden benim beklediğim kadar ortak bir dili kurmanın zor olabileceğini fark ettim.” (P1)

“However, this is a topic that we talked about all the time, but I mean, since it is not personally (relatable) important, since I didn’t experience anything about it in my life, it was not in my mind or let’s say I was flexible, thinking we are all humans we can easily learn and teach, but after the comments, my friend made about cultural difference.. so, culture means everything. Language, religion, so it means everything. I realized that students’ understandings will be diverse. It will be different from that perspective, therefore, I realized that it could be hard to establish a unified

communication medium as I expected.” (P1)

Intervention Promoted New Perspectives As the pre-service teachers noted, the intervention led them to see other pre-service teachers’ perceptions and helped them to widen their perspective for the situations on which they have thought to write a reflection and sometimes made them change their perspective by criticizing their thoughts. Through the intervention pre-service teachers’ gained access to and learnt about one another's perspectives and broaden their views.

“Birkaç kişininkini okudum ve böyle, insanlar gerçekten iyi şeyler yazmış. Onları görünce benim de ufakumun geliştiğini düşünüyorum.” (P5)

“I read some of the others (reflections) and people have written really good things. When I see such things, I think my horizon also expands.” (P5)

“Şöyle avantajlı sonuçta orada bir konu var ve onu farklı yönlerden ele almaya çalışıyoruz yani farklı şekillerde düşünmeye çalışıyoruz. Mesela bu da bizim için bir avantaj olabilir çünkü karşımıza ileride milyon tane şey çıkacak, farklı görüş ve bakış açısı çıkacak. Mesela biz ona göre kendi uyguladığımız yöntemleri uygulamak zorundayız o yüzden farklı bakış açısına yardımcı olan her şey yardımcı olur diye düşünüyorum bize. (P2)

“It is advantageous like that ultimately there is a topic, and we are trying to approach it from different aspects, I mean, we are trying to think differently. For example, this can also be an advantage for us because in the future we will face a million things, different views, and points of views. For example, depending on these (differences) we must use our methods, because of this I think anything that helps us gain a different perspective will be helpful.” (P2)

In this quotation, one pre-service teacher mentioned that exploring new opinions, perspectives and dimensions might be useful for their future profession as they are expected to function as a teacher where there will always be different perspectives. Pre-service teachers’ reported that their perspective, understandings about teaching, learning and their professional identities changed as the following except exemplifies.

“Çünkü dediğim gibi, senenin ilk başındaki (öğrencinin adı) ve senenin sonundaki (öğrencinin adı) tamamen, çok farklı yani. Eminim bakış açım falan değişti... Öğretmen algımın değiştiğine eminim yani.” (P5)

“Because as I said, the (name of the pre-service teacher) at the beginning of the year and the (name of the pre-service teacher) in the end are very different. I am sure that my perspective has changed... I am sure that my understanding of being a teacher has changed” (P5)

“Geçen seneki benle şimdiki bana yan yana oturtup aynı soruları sorsanız büyük ihtimalle farklı cevaplar verecektim.” (P4)

“If you were to make last-year-version of me and this-year-version of me sit next to each other and ask them the same questions, most probably I would give different answers.” (P4)

Facilitating Internalization of Teacher Identity According to the thematic analysis, the intervention facilitated math teacher identity development as it enabled pre-service teachers to internalize who they were as a potential math teacher, what was their existed feeling toward math. During the interview, they defined their identity as a math teacher and identify their values. From their statements, it was concluded that the internalization process occurred as pre-service teachers acknowledged their true feelings toward math, opinions about teaching math and being a math teacher. They mentioned they felt motivated and excited about their profession.

“... ben, ben öğretmenim. Bunu ne kadar içselleştirebildiğimi blog yazarken çok hissettim. Çünkü şey hani böyle, bilmiyorum bir anda bir havaya girdim yani böyle...O kadar değişik orjinal başlıklar da buldum. Ben çok severim böyle şeyleri.” (P3)

“ ... I, I am a teacher. I realized how much I internalized that as I write blogs. Because it is like, suddenly I had entered a mood like that...I also found many original topics. I like such stuff.” (P3)

“Mesleğe ısınmanı sağladı, gelişimine faydası oldu. Evet biraz daha ısındım mesleğe yani böyle artık ‘Hadi uygulayalım, hadi öğretmen olalım!’ falan... Heyecanım geldi çünkü yazdığım, katıldığım katılmadığım bir sürü düşünceyi uygulamak ve işte kendi üzerinde de denemek öğrencilerim üzerinde de denemek istedim. Çünkü işte ben mesela yine hep aynı örneği veriyorum ama, farklı kültürlerden olan

“It made me feel enthusiastic about my profession, it helped my development. Yes, I am more eager for the job, I mean, like” Let’s apply it, let’s become teachers!’... It made me get excited since I wanted to apply the thoughts I wrote, the thoughts I agreed with or not, I wanted to try them on myself and the students. I am giving the same examples but, if I wrote a method

çocuklara sınıfta şöyle yaklaşırım diye orada bir teknik yazdıysam, bu tekniği uygulamak ve çocukların buna karşı tepkileri neler... Ona göre o tekniği revize etmek falan istedim, havada kaldı yani. Onu artık uygulamak istedim. Sınıfımın önünde...” (P1)

about approaching kids from other cultures with a certain approach, I longed for applying it in the classroom, in front of the kids and what are the reactions of these kids to that... I wanted to revise that method accordingly, it remained a bit abstract. I wanted to implement it now. In front of my class...” (P1)

Pre-service students mentioned that they established a sense of belonging while writing the reflections and accepted that they were very close to becoming a teacher in the classroom and to face the things they were anticipating in their reflective writings which made the process more than just an assignment of their must course.

“Şöyle bir yıl sonra mezunum, bir yıl sonra inşallah öğretmen olacağım. Yani en azından bir öğretmen adayı olacağım. Yani mesleğimin ne kadar yaklaştığını anlamış oldum. Genel itibarıyla... Ya aidiyet duygum gelişti bu dönem boyunca.” (P5)

“I am a graduate after a year, I hope I will be a teacher next year. I mean, at least I will be a teacher nominee. I mean, I realized how I am close to being a teacher. Generally, ... My sense of belonging is developed during this term.” (P5)

Biraz şey oldu, ‘‘Wow, gerçekten öğretmen olacağım!’’. Çünkü ilk başlarda ben, ödev için yazıyordum hakikaten, sonraları baktım... Böyle, gerçekten öğretmen olma adayı olan bir insan olarak yazmaya başladım, böyle sınıfımı hayal etmeye falan başladım, o ortamı... Dedim ki ‘‘Gerçekten bu mesleği yapacağım. Bu mesleğin içine gireceğim’’ Sonlara doğru böyle, bu fikir geldi yani o açıdan güzel olmuştu.” (P4)

“It was like ‘wow, I actually will become a teacher!’. Because at the beginning I was writing it as homework then I realized... Like, I started to write like a teacher candidate, like I started to imagine my class, that environment... And I said ‘I am going to do this job. I will enter into this profession.’ approaching the end, I had such ideas, it was nice from that perspective.” (P4)

4.2.3. Affordances of the Intervention for Teacher Identity Development

The third theme defined was about how pre-service teachers perceived the implementation of the intervention. The general perception of pre-service teachers about the intervention was positive. Under this theme, pre-service teachers reflected

that they were satisfied with the intervention but also complained about the workload. They also suggested ways to make the intervention more effective.

According to the results, pre-service teachers were generally satisfied with not only the purpose of the intervention but also with the type of reflective activities used in the intervention. Most of the pre-service teachers stated that they enjoyed the process.

“Reflectionlarla alakalı, ben çok severek yaptım çünkü sevdim, içeriğini.” (P4) *“About reflections, I did with pleasure since I liked the content” (P4)*

“Yani çok kaliteli çok... Sıralama olarak falan da yani, düşünme sırası olarak da çok güzeldi.” (P1) *“I mean it is very high quality. Also, by the means of order too, the order of thinking was also very nice.” (P1)*

“Ya reflection ödevleri benim için çok yararlı oldu. O yüzden, mesela ben reflection kısmını çok sevdim hatta her hafta eğlenerek yaptım öyle söyleyeyim” (P2) *“So, the reflection homework was very beneficial for me. Therefore, for example, I liked the reflection part I performed with joy.” (P2)*

They believed that the intervention and the flow of the intervention was ‘meaningful (S7)’; however, nearly all pre-service teachers who participated in the reflective interview mentioned the workload as the main negative side of the intervention. They highlighted that they were tired of writing every week and writing the reflections took too much time and they were responsible for other homework for other courses they took therefore they considered weekly reflections as intense workload.

“Sadece biraz zaman olarak zorlanmış olabilirim bazı yerlerde.” (P4) *“I might have had little problems with the time arrangement at several points.” (P4)*

“Ama şöyle bir şey var, yoğunluğu beni çok yordu çünkü hani her hafta yapıyoruz. Mesela aksatıyoruz ister *“But on the other hand, the density (of the tasks) wore me out since it had to do it every week. In our other*

istememez sınavlar, ödevler çünkü... Aslında şöyle bir şey var bizim diğer dersimizde de aynı olay döndüğü için, onda sadece blog yazmadık onda da her hafta case'imiz vardı, şey hani hepsi üst üste geldiği için bu biraz daralıtı." (P3)

course, we had the same issue, we did not only write blogs but also had cases every week. I mean they all overlapped and a bit oppressed" (P3)

"Öncelikle çok uğraştırıcıydı yani. Çünkü her hafta olması falan biraz yoruyordu." (P7)

"First of all, it was very demanding. Because it was in each week, it was a bit tiring." (P7)

"...dediğim gibi iş yükü çok fazlaydı ve insanların vakti yoktu hani. Bu uhm... Tek bir hani derste olan bir durum değil. Her derste bir şeyler isteniyor bizden ve hani eğitim dersleri yoğunlaştıkça bilirsin sen de; sınavlardan çok ödevlere odaklanılıyor. Her hafta ödev veriliyo işte proje ödevleri oluyor, interview ödevleri... Türlü türlü bir sürü ödev oluyor. Ve hani sürekli kafamızda bir sürü bir şeyler oluyor. Sürekli hani ben hiç boş günümün geçtiğini hatırlamıyorum bu dönem yani çok yoğundu." (P6)

"... as I said, the workload was too much, and people simply did not have enough time. This is not unique to this course. Every other course demands us something and you know, as the education courses progress, they started to focus more on homework than exams. We are given some homework each week, projects homework, interview homework... there are a lot of, all sorts of homework. And you know, there is always something in our minds. Always, I mean I don't remember having any idle days during this term, it was very busy." (P6)

The participants indicated that some changes in the intervention can be helpful for them to benefit more from the intervention more. A popular suggestion was about having a more flexible timeline and flexibility in workload management. They wanted it to allow them to plan the workload and due dates more freely while dealing with multiple responsibilities at the university. Pre-service teachers highlighted greater flexibility would increase their motivation and desire to write the reflections.

"Yani, mesela esnek olabilirdi. Yani haftalık yazmak değil de... Ya o zaman da verimden düşebilirdi hani. Bilmiyorum, nasıl olması gerektiğini gerçekten bilmiyorum ama aklıma şey gelmişti bir hafta yazmak... Bir hafta mesela sadece

"I mean, it could have been more flexible. I mean not writing every week but... I mean, then it might not be efficient. I do not know how it should be realistic, but I thought of writing only for a week... Such as the

sorular yayımlansın ama biz bir şey yazmayalım. Yani, ben de işte mesela dedim ya işte bir hafta yazsaydık, bir hafta düşünme... Sadece, böyle ben, şey istedim yani, bu hafta o soruları göreyim, düşüneyim ama onun uğruna hiçbir şey yapmayayım. Kendi kafamın arkasında, hep o soruları cevaplandırayım gibi şeyler istedim. Hani böyle kendime özel, alt görevler de olsun istedim.“ (P1)

questions are published for a week, but we don't write anything. What I mean is, for example, writing one week but not writing the following week, only thinking about the prompts. Just, like I wanted to, you know, this week I see the questions and think about it but do nothing about them. I wished to answer these questions in my mind. I mean, I wanted to have personal side-quests as well.” (P1)

“Daha ‘inner motivation’ olacak bir şekilde çevrilse, ki bu çok zor bir şey... Ama belki o zaman hani insanlar için bir anlam ifade eder ama şeydi yani, çok zoraki yaptık bunu. O yüzden böyle oldu. Belki çok uzun bir döneme yayılıysaydı iki haftada bir falan olsaydı... O zaman çok daha iyi olabilirdi. “ (P5)

“If it could be converted into something promoting more self-motivation, which is very hard... But then, you know, maybe it would start to mean something for the people, but it was more like mandatory. This is the reason. Perhaps, if it was spread out to a longer period like once in two weeks, then it might be much better.” (P5)

“Biraz daha sayısı azaltılabilirse ya da her hafta değil de aralıklı aralıklı yazdırılırsa, çok daha faydalı olabilir bence. Herkeste mesela şu oluyor; çok fazla iş yükü olduğu için ve zaman olmadığı için herkes diyor ki hani işte okuyayım bir tanesini cevaplayayım geçsin gitsin. Hani bu şekilde bi kafa oluşuyor insanlarda çünkü artık onu yapıp kafandan atmak istiyorsun yani kafandan atmak istiyorsun o da biraz artık şeye dönüyor hani yapmış olmak için yapmak gibi bir şey oluyor. O yüzden biraz da hani diğer iş yüklerini azaltıp... Veya ne bileyim en azından teknoloji dersi için olmasaydı bu, çünkü teknoloji dersi zaten başlı başına çok yoğun bi ders hani labı var ödevleri oluyor işte şudur budur... Hani başka bir dersler birleştirilseydi belki çok daha okunulur olabilirdi yani daha faydalı olabilirdi.” (P6)

“I believe, if the number were decreased or not each week but written spaced-out, it would be more beneficial. Everyone has the same issue, due to too much workload and scarce time, everyone just tended to read and give sloppy answers. You know, people are having this tendency, since you want to just complete the task and get rid of it, I mean, you want to get rid of it and it becomes more like completing just to do it. Therefore, maybe decreasing other workloads... Or I do not know, at least it should not be a requirement for a technology course, since technology course is alone a very packed course, I mean, labs, homework, a bit of this, a bit of that... I mean if it was integrated tp other courses, it might be more beneficial.” (P6)

Another point pre-service teacher made was about increasing the interaction with some structure in the design of the intervention. They noted that the intervention should orient them more to read each other's reflections to benefit more from this

process. They admitted that they did not actually read each other's reflections and therefore did not interact with others.

“Ama hani birbirimizin yorumlarını okuyamıyoruz sonuçta, herkes kendi düşüncesini yazıyor ve onun üzerine tekrar konuşulmuyor. O yüzden bilmiyorum hani, sadece bizim düşüncelerimizi hoca öğrenebiliyor yani. O da bizim için ne kadar yararlı tartışılabilir. Ama en azından kendimizi ifade etmemiz açısından.” (S6)

“But after all, you can't read the comments of your peers, people writing their comments and they are not being discussed later. Therefore, I do not know, only the instructor could learn our thoughts. And then the benefits of it is debatable. However, it is nice to express yourself at least.” (S6)

“Yani ne kadar şey olur bilmiyorum ama, hani bazı insanlar sonuçta diğerlerinin yazdıklarını okumuyorlar. Ya da mesela her hafta okumaya da vaktimiz olmayabiliyor. Mesela şey olabilir, eh... Başka bir yazıyla ilgili bir yorum mesela yapma zorunluluğu olabilir. Hani en az bir yazı o zaman o hafta okunacak demektir.” (S2)

“I am not sure how much it makes sense but, you know, some people eventually are not reading what others wrote. Or for instance, we might not have enough time to read every week. Maybe it could be like, there could be an obligation to comment on another writing. Then it means at least one reflection will be read that week.” (S2)

“Yani şöyle, gerçi dürüst olarak konuşacaksam, birbirimizin reflectiolarını okumak zorunda olmadığımız için bu uygulama herhangi bir farkındalık yaratmayacak bence çünkü benim hangi arkadaşım gelip benim yazdığım şeyleri okuyacak? Hani zannetmiyorum, öyle bir şey olmayacak yani. O yüzden o kısım desteklenebilir” (S7)

“So, I mean, to be honest, as we are not required to read each others' writings, this will not create a difference in application because which one of my friends is going to read what I wrote? I do not think so, it will not happen. Therefore, this part could be supported.” (S7)

4.4.Overall Summary of the Results

This study includes quantitative and qualitative data. Quantitative method was utilized see the difference in pre-service mathematics teachers' identity in terms of their ETIM scores, which includes 3 parts as self-categorization, confidence/self-efficacy in becoming a teacher and natural inclination towards children and teaching was conducted with this aim. In the original study of ETIM, developers (Friesen & Besley, 2013) stated that all parts can be reduced under a single dimension that is 'teacher identity'. However, to see the effects of the intervention more deeply, in this

study, paired sampled t-test was conducted both by reducing all dimensions under teacher identity and by examining all parts separately. According to the results of the paired-samples t-test conducted on teacher identity dimension, there was a significant difference between the pre and post-intervention scores ($MD=-3.36$, $SD=7.55$), $t(30)=-2.47$, $p<.05$ (Figure 14). According to the results of the paired-sample t-tests conducted separately for each dimension, there existed a significant difference between the pre- and the post-intervention scores of self-categorization ($MD=-0.22$, $SD=.62$, $t(30)=-1.96$, $p<.05$) and confidence/self-efficacy dimensions ($MD=-0.26$, $SD=.81$, $t(30)=-1.77$, $p<.05$) while there existed no significant difference in the scores of the natural inclination towards children and teaching dimension ($MD=-0.12$, $SD=.54$, $t(30)=-1.22$, $p>.05$).

Semi-structured interviews were performed to understand the pre-service teachers' perceptions and adopted a thematic analysis approach. For the first question, data were analysed through a deductive thematic analysis and grounded in Beijaard et al. (2000)'s in the framework. For the third question, inductive thematic analysis was adopted in which the codes and themes were obtained from data throughout the coding process.

The themes of the first research question were pedagogical expertise, didactical expertise and subject matter expertise. All pre-service teachers believed that they will be good and efficient teachers in the future and feel competent in terms of this expertise. According to the pre-service teachers about these themes demonstrated that the pedagogical expertise and didactical expertise are the most important expertise for a strong teacher identity.

Themes for the third question were about the affordances of the intervention and the feedback about the intervention in general. Pre-service teachers mostly highlighted that the intervention made them inclined to think on education-related issues such as their personal educational philosophies, being a teacher and teaching. Additionally, in some statements, it was observed that this thinking process made them aware of not only their existed beliefs, thoughts and knowledge but also made them aware of the cultural diversity among students. Besides, rather than being aware, the intervention also made them change their existed perception about educational issues.

Lastly, based on the perception of pre-service teachers, the intervention facilitated the internalization process of being a math teacher since the intervention made pre-service teachers realise who they are as potential math teachers, their existing feelings toward mathematics, what were their main values as a teacher, how close they were to be a teacher. From this point of view, it was concluded that the intervention contributed to their sense of engagement to the profession.

As for the feedback about the intervention, the pre-service teachers were generally satisfied with the implementation process and aim of the intervention. They found it meaningful and instructive. Nonetheless, they were not satisfied with the workload they had throughout the term. It was concluded that if this intervention could be done in a less busy term, the pre-service teacher might be happier and more motivated to write reflections. They suggested preparing intervention with a more flexible timeline to give them personal time to think on the weekly topic more deeply. It was also suggested that an intervention structure which encourages more peer interactions might be more beneficial to learn from others for pre-service teachers.

CHAPTER 5

DISCUSSION AND IMPLICATIONS

In this section, the findings of the study were synthesized and discussed in relation to the findings of the literature and the theoretical framework, and suggestions for a more structured professional development shared.

5.1. Discussion

The purpose of the study was to describe and explain the effects of online anticipatory reflective writing on the teacher identity development of third-grade pre-service Mathematics teachers studying in elementary mathematics education in a state university of Turkey. A 10-week reflective writing intervention program was prepared to promote the pre-service elementary mathematics teachers' professional identity development. In this intervention, the pre-service teachers wrote and published weekly reflections about the topics based on the teacher identity framework of Beijaard et al. (2000). In the ETIM, pre-service teachers' self-categorization, confidence, their natural inclination towards children and teaching were examined. Interview findings focussed on their perception about the definition of identity, thinking, awareness, perception and internalization of the profession. The first research question of this study focused on how pre-service teachers see themselves as a teacher. The framework adopted for this study highlights three main expertise teachers' while defining teacher identity" (Beijaard et al., 2000); teacher as a subject matter expert "who bases his/her profession on subject matter knowledge and skills" (p.754), teacher as a pedagogical expert "who bases his/her profession on knowledge and skills to support students' social, emotional, and moral development" (p.754) and teacher as a didactical expert "who bases his/her profession on knowledge and skills

regarding the planning, execution, and evaluation of teaching and learning processes” (p.754). Pre-service teachers in this study expressed their identities by focusing all three of this expertise which was similar to other studies in the literature as well (Balban, 2015; Beijaard et al., 2000). In addition, similar to Beijaard et al. (2000), they reported that they see their professional identity as a combination of these three dimensions, even the priority pre-service teachers give to these dimension of teacher identity differs. In this study, pre-service teachers focused more on didactical and pedagogical dimensions of their teacher identity compared to the subject matter expertise, whereas Beijaard and De Vries (1997) reported that teachers tend to focus more on pedagogical dimensions compared to the other two. In terms of subject matter, expert pre-service teachers reported that they perceive themselves competent which was similar to the results of the study of Balban (2015).

As reported above, it was seen that pre-service teachers emphasized pedagogical and didactical expertise sides of being a teacher rather than subject matter expertise although the intervention directed them to give attention to all three expertise equally. In the literature, studies support that the approach of the faculty of education shapes the pre-service teachers’ understanding of being a teacher (Lutovac & Kaasila 2014; Korthagen, 2004). The courses offered by the faculty the pre-service teachers study in this study focuses on didactical methods and pedagogy, not mathematics subject-matter courses. The mathematics courses were offered by the department of mathematics, an independently working faculty. Considering this situation, the main aim of the faculty of education could be determined as strengthening pedagogical and didactical expertise in teacher education rather than providing subject matter knowledge. This approach demonstrated similarities with the pre-service mathematics teachers’ definitions of being an elementary math teacher. According to the results of the first theme, pre-service teachers mostly and equally highlighted the pedagogical and didactical sides of being a math teacher. Their emphasis was on developing pre-service teachers’ views of communication with the student, understanding students’ both mathematical and personal needs and expectation, orienting teaching methods through these needs and interests, and the role of the teacher in this processes. The discourses pre-service teachers were not including the necessity of enhancing self-

confidence or knowledge in mathematics. On the contrary, the responses were demonstrating that pre-service teachers already have the self-confidence to teach math. Thus, it could be interpreted that there is a relationship between the focus of the faculty of education and pre-service teachers' perception of how they see themselves as a teacher as in the study of Lutovac and Kaasila (2014).

The results of this study pointed out that anticipatory reflective writing intervention had a positive effect on pre-service teachers identity development. The pre-post test results of ETIM indicated that there was a significant positive difference in the identity development of the pre-service teachers ($MD=-3.36$, $SD=7.55$), $t(30)=-2.47$, $p<.05$). In this respect, the findings of the study corroborate much earlier research that shows the positive affordances of reflective writing practices in teacher education for teacher identity development (Brownlee, Dart, Boulton-lewis, & McCrindle, 1998; Campbell, 2005; de la Torre Cruz & Arias, 2007; Merseth et al., 2008; Otteson, 2007).

According to the pre-service teachers in this study the intervention was effective as reflections enabled them to think. This finding was in line with previous studies which demonstrated the positive effects of the reflective writing on thinking (Brownlee, Dart, Boulton-lewis, & McCrindle, 1998; Campbell, 2005; Çelikdemir, 2018; de la Torre Cruz & Arias, 2007; Durmaz & Yiğitoğlu, 2017; Gencil, & Candan, 2014; Kavanoz & Yüksel, 2017; Küçükali, 2017; Merseth et al., 2008; Otteson, 2007; Tütüniş & Hacıfazlıoğlu, 2018; Yayli, 2012).

In this study, pre-service math teachers reflected on the future students, their misconception, their possible expectations and needs, math learning methods, teaching strategies which could be applied in the future and the future conditions that pre-service math teachers will face. These future-oriented reflections were anticipatory for pre-service teachers since they do not face any of the given situations in real life as a professional and an official teacher. Pre-service teachers pointed out that reflections promoted awareness about these situations. Similarly, pre-service teachers in Çelikdemir (2018)' s study also indicated that reflection activities help them become aware of their teaching self-

more. Thinking about future actions is important and necessary to promote awareness about the profession in the literature of anticipatory reflective writing (Conway, 2001; Walkinton, 2005; Wilson, 2008) since it generally includes evaluating oneself for improvement and lead to self-understanding (Hmelo & Ferrari, 1997). Anticipatory reflective writing allows reflective writers to criticize themselves in the context of the possible occurrences they may face in the future (Van Mannen, 1995); therefore it has positive effects on being aware of their self-categorization, teaching beliefs and teacher identity (Conway, 2001).

Pre-service Math teachers believed that the intervention also presented an opportunity to explore different perspectives as was reported in previous research (Celikdemir, 2018; Lerseth, 2013). Similiarly, Akkoyunlu et al. (2016) mentioned that the continuity of reflective diaries reinforced individuals' sense of professional responsibility and enabled pre-service teachers to gain new perspectives. Accordingly, the results indicated that the anticipatory reflective writing promoted pre-service teachers internalization of their professional teacher identity in parallel with related literature (Bengtsson, 2003; Van Manen, 1995).

Pre-service teachers became more aware of the issues regarding their future profession and their perspectives are more based on concrete ideas on which they made research and criticism. Based on these findings, it could be concluded that pre-service teachers can make more conscious choices related to their further professional development after reflecting on the future (Lutovac & Kaasila 2014; Korthagen, 2004; Urzúa & Vásquez; 2008). Without having a chance to criticize personal thoughts and beliefs, pre-service teachers cannot have metacognition about their perceptions of the future and less confident to make decisions which might result in with a weak teacher identity (Alsup, 2006; Britzman, 2003). The studies of Urzúa and Vásquez (2008), Jacobs (2007) and Kazemi and Franke (2004) asserted that anticipatory reflections improved several aspects of teachers' metacognition such as awareness, perspective, self-identification, self-confidence and internalization of the profession which can be interpreted as actual demonstrations of professional identity construction.

According to the findings of the third theme, the pre-service teacher thought that the intervention was meaningful and beneficial. This result is consistent with the

previous research that emphasizes the use of reflective writing to promote pre-service teacher identity development (Conway, 2001; Durmaz & Yiğitoğlu, 2017; Lutovac & Kaasila 2014; Kavanoz & Yüksel, 2017; Korthagen, 2004; Küçükali, 2017; Milewski, Herbst, Bardelli & Hetrick, 2018; Tütüniş & Hacifazlıoğlu, 2018; Urzua & Vasquez, 2008; Walkington, 2005). Even so, almost all the participant pre-service teachers suggested some adjustments for the intervention to become more beneficial. Mostly, they reported that having a more flexible timeline for reflective writing could be better. According to the pre-service teachers, deadlines caused them to feel tired and trapped. However, they thought having time flexibility could enable them to think and reflect on their thoughts more comfortably and deeply. About the workload of the study, all the participants stated that they found it loaded but also, they were satisfied with the reflection writing assignments. They noted that although writing every week decreased their motivation to write (Flores, 2014), they enjoyed the process and found it satisfying in terms of self-development. Moreover, it was concluded that promoting interaction among pre-service teachers could be another way to improve the effectiveness of the intervention. The intervention used a public online platform which everybody could see each others' writings easily, without permission. Although they had the chance to see each others' reflections, most of them did not read others reflections, however, they suggested reading each others' reflections should be obligatory in the intervention.

The quantitative and qualitative data analysis support each other in the sense that the intervention had a positive effect on pre-service teachers identity development process. It was seen that pre-service teachers were satisfied with the positive effects of reflective writing on their identity development and mentioned the affordances of the intervention for their identity development. These affordances were indicated as facilitating thinking and awareness, promoting new perspectives and facilitating to internalize identity. The intervention helped them to internalize teacher identity more, so after the intervention, they started to see themselves more as a teacher. They reported that

they became more aware of their understanding of being a professional teacher and had a chance to reconceptualize their understanding. When the ETIM results and qualitative results were considered together, it was concluded that this reconceptualization affected their self-efficiency and self-categorization like indicated in the studies of Borkowski and Kurtz (1987) and Moen (2009). They defined metacognition as awareness and reported that high-level metacognition promotes efficiency. Pre-service teachers stated that they started to feel more efficient and aware of educational issues after the intervention and the ETIM results supported this argument under the self-efficiency dimension. Pre-service teachers indicated that they internalized teacher identity more due to the intervention. When these two data were combined, it was concluded that pre-service teachers could conceptualize their identity more deeply by reflections and they started to categorize themselves as a teacher more than the past. This conclusion was in parallel to the results of previous research demonstrating the useful effects of reflective writing on professional development in the pre-service stage (Beltman et al., 2015; Lerseth, 2013; Urzúa & Vásquez, 2008; Walkington, 2005).

5.2.Implications

5.2.1. Implications for Practice

This study offered some implications for teacher education programs. Basically, the study showed pre-service math teachers' identity formation can be supported by through anticipatory reflection interventions. Teacher education programs should focus on frequently encouraging the development of a teacher identity by facilitating pre-service teacher reflective activities that allow them to criticize and build on their perception.

In this study, pre-service teachers focussed on pedagogical and didactical expertise when they are defining their teacher identity. This finding has implications for teachers educators as to how pre-service teachers see their teacher identity could be affected by the orientation of the faculty (Lutovac & Kaasila 2014) therefore teacher educators need to be aware of their own orientations, educational program and plan to

enhance how pre-service teachers see themselves. Faculties should be aware of this situation and make new arrangements by considering it.

The literature points a significant relationship between the strength of teacher identity and the attrition of math teachers within the first five years of the profession (Ingersoll, 2001). According to the results, if math teachers could develop a strong sense of identity in college, they will be less tend to quit the teaching profession (Alsup, 2006; Britzman, 2003). The literature supports that if the teacher education and mathematics education models are based on competency, knowledge and skills (Korthagen, 2004) rather than the development of strong and confident teacher identity and reflection skills (Kaasila & Lauriala, 2012), the phase of obtaining an understanding of one's identity is disregarded. However, the development of strong and confident teacher identity and reflection abilities could enhance pre-service teachers' perspectives of their future as mathematics teachers (Lutovac & Kaasila 2014). Through the intervention, pre-service teachers had a chance to verbalize their intentions for the future, to perceive expected consequences, to investigate possibilities, and to reflect on their future actions and their roles as math teachers. As a result, preservice teachers felt more efficient for the future profession. Pre-service teacher education developers and the stakeholders should be aware of these positive effects of anticipatory reflective writing on strengthening pre-service teacher identity to decrease the level of the tendency to attrition and plan interventions related to it. It is considered that improving this sort of interventions can provide them with more and better opportunities for reflection before professional teaching and maybe so nurture their sense of self-efficacy and professional identity.

If a weekly reflective writing schedule is aimed to be integrated into a teacher education curriculum, the workload of the whole teacher education program should be considered for better results and more benefits. Furthermore, giving flexible time is actually giving a chance to reflect when pre-service teachers felt ready to reflect and this could promote their motivation to reflect and consequently affect the quality of reflections. Lastly, integrating directions

increasing peer interaction into the intervention is necessary for obtaining more efficiency from the intervention.

All in all, the implications of this study would include giving place to anticipatory reflective writing activities in pre-service teacher education, planning more flexible time-schedule for reflective writing activities and imposing an obligation or arranging settings to promote interaction among pre-service teachers to support teacher identity development during teacher education.

5.2.2. Implications for the Educational Research

The future studies aiming to focus on the pre-service teachers' identity development through anticipatory reflective writing can adopt a longitudinal design to gather data for a longer period to get more integrative conclusions about pre-service identity development process. Similar studies can also be planned at other education faculties to understand the perspectives of pre-service teachers more deeply on their own teacher identities and the effects of intervention regarding different contexts and influencing factors. Lastly, since the study cannot be generalized beyond the particular people and setting of the intervention, the best way to meet the external validity requirements of findings is to replicate the intervention. In-depth interviews with teacher educators would also be useful to gain a deeper insight into the development of teacher identity. Also, an experimental study with a control group to observe the effect of anticipatory online reflections can be conducted. There were instances when pre-service teachers focussed on the community aspect of teacher identity development during the study, which was not in the scope of this study. However, a study to investigate the community aspect of such an intervention might yield essential insight into teacher identity development.

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APPENDICES

A. PROMPT LIST

Week	Theme	Topic	Reference
1	Teacher development	Fuller and Brown's stages of teacher concern	n, B. (2016). <i>Teaching for success: Developing your teacher identity in today's classroom</i> . Routledge.
2	Teacher development	Educational philosophy	s, S. (2010, March 24). "Philosophy" of "Education". Retrieved October 14, 2020, from https://www.stephenhicks.org/2010/03/24/philosophy-of-education/
3	Pedagogical expertise	Knowledge domain (love of math)	n, J. (2014). <i>Teach Now! Mathematics: Becoming a Great Mathematics Teacher</i> . Routledge.
4	Didactical expertise	Pedagogical content knowledge	n, J. (2014). <i>Teach Now! Mathematics: Becoming a Great Mathematics Teacher</i> . Routledge.
5	Subject matter expertise	Content knowledge	X., & Carspecken, P. F. (2019). <i>Philosophy, Learning and the Mathematics Curriculum: Dialectal Materialism and Pragmatism related to Chinese and US Mathematics Curriculum</i> . Brill Sense.
6	Didactical expertise	How students learn	irs, M. (2017). <i>Reflective practice for teachers</i> . Sage
7	Pedagogical expertise	Digital generation	s, I., McCain, T., & Crockett, L. (2010). <i>Understanding the digital generation: Teaching and</i>

			learning in the new digital landscape. Corwin Press
8	Pedagogical expertise	Diverse education	ig, A. H. (2005). Goals for Achieving Diversity in Mathematics Classrooms. <i>Mathematics Teacher</i> , 99(4), 253-259.
9	Teacher development	Trinity	rs, M. (2017). <i>Reflective practice for teachers</i> . Sage
10	Teacher development	Educational philosophy	s, S. (2010, March 24). "Philosophy" Of "Education". Lecture.

A. PROMPTS

1. The First Week Blog Post Prompt

Please, write your opinion about the first question; then, read stages of personal-professional development for beginning teachers given below, developed by Frances Fuller and Oliver Bown in 1975 (Olsen, 2016). Then answer the second and the third questions.

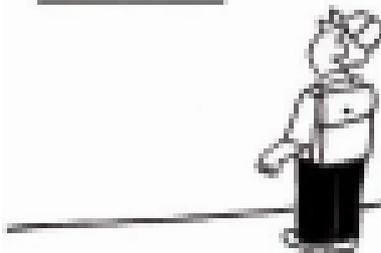
1. How does a teacher professionally develop?

Fuller and Bown's Stages of Teacher Concern

First stage. Beginning teachers (often in their early twenties and slightly rebellious in temperament) identify more with students than with other teachers and face a troubling authority bind when they enter the classroom: they view their entry into teaching as “going over to the enemy.” They struggle to accept their role as the authority because they would rather be the students’ friend.



Second stage: Survival concerns. Novice



teachers are mostly concerned with just getting through the day. This kind of survival mode pushes the deeper aspects of teaching and learning into the background as novices focus on being liked, managing the class, and avoiding mistakes. Being a deeply reflective teacher is postponed when day-to-day routines become more established.

Third stage: Teaching-situation concerns. Novice teachers feel overwhelmed by all the non-instructional work of teaching, such as being sure to follow school policies, doing paperwork, and finding sufficient materials. The focus on the logistical dimensions of teaching (e.g., working the copy machine) precludes deep attention to teaching and learning.



Fourth stage: Student concerns. Novice



teachers, now finally becoming able to attend to the students in front of them, begin to worry that they cannot know and focus on all the needs of their many students. They may feel that their wonderful students deserve a more accomplished teacher, or that they have too many students to teach well. They feel guilty because they believe their students deserve better.

2. According to your opinion, how much the education offered you by the faculty of education prepare you for the given stages?
3. For each stage, which characteristic feature of a teacher has to be developed well to pass the stage sturdily?

Reference:

Olsen, B. S. (2016). *Teaching for success: Developing your teacher identity in today's classroom*. New York, NY: Routledge.

2. The Second Week Blog Post Prompt

This week's prompt is about the philosophy of education. You do not need to read the “Sample Educational Philosophy Statement” below. It is just a guide to help you to understand how to respond to the given questions if you need a sample. Other than that, you are free to answer them as you wish.

What Questions

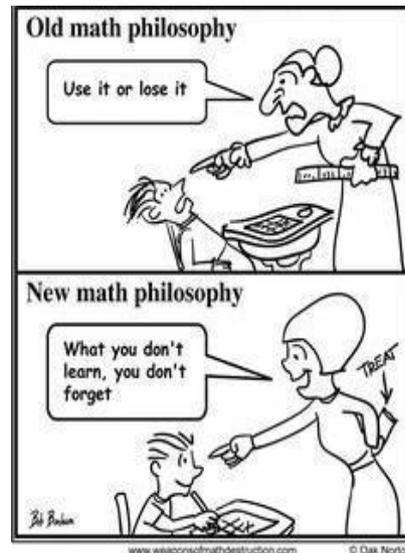
- What is the purpose of education? How do you define it?
- What responsibilities do you have as a teacher?
- How do you think children learn math?

So What Questions

- How will your beliefs about the ‘what questions’ part affect your teaching? Explain them;
 - o In terms of classroom management
 - o In terms of instructional strategies
 - o In terms of curriculum design
 - o In terms of assessment of learning
- What are your goals for your students?

Now What Questions

- Considering your beliefs and their effect on your teaching, what actions should you take to become a better teacher? Or what kind of preparation should teacher education offer?



Sample Educational Philosophy Statement

My Philosophy Statement on Education

I believe that each child is a unique individual who needs a secure, caring, and stimulating atmosphere in which to grow and mature emotionally, intellectually, physically, and socially. It is my desire as an educator to help students meet their fullest potential in these areas by providing a safe environment, supports risk-taking, and

invites a sharing of ideas. There are three elements that I believe are conducive to establishing such an environment, (1) the teacher acting as a guide, (2) allowing the child's natural curiosity to direct his/her learning, and (3) promoting respect for all things and all people.

When the teacher's role is to guide, providing access to information rather than acting as the primary source of information, the students' search for knowledge is met as they learn to find answers to their questions. For students to construct knowledge, they need the opportunity to discover for themselves and practise skills in authentic situations. Providing students access to hands-on activities and allowing adequate time and space to use materials that reinforce the lesson being studied creates an opportunity for individual discovery and construction of knowledge to occur.

Equally important to self-discovery is having the opportunity to study things that are meaningful and relevant to one's life and interests. Developing a curriculum around student interests fosters intrinsic motivation and stimulates the passion to learn. One way to take learning in a direction relevant to student interest is to invite student dialogue about the lessons and units of study. Given the opportunity for input, students generate ideas and set goals that make for much richer activities than I could have created or imagined myself. When students have ownership in the curriculum, they are motivated to work hard and master the skills necessary to reach their goals.

Helping students to develop a deep love and respect for themselves, others, and their environment occurs through an open sharing of ideas and a judicious approach to discipline. When the voice of each student is heard, and environment evolves where students feel free to express themselves. Class meetings are one way to encourage such dialogue. I believe children have greater respect for their teachers, their peers, and the lessons presented when they feel safe and sure of what is expected of them. In setting fair and consistent rules initially and stating the importance of every activity, students are shown respect for their presence and time. In turn, they learn to respect themselves, others, and their environment.

For myself, teaching provides an opportunity for continual learning and growth. One of my hopes as an educator is to instill a love of learning in my students, as I share my passion for learning with them. I feel there is a need for compassionate, strong, and dedicated individuals who are excited about working with children. In our competitive society, it is important for students to not only receive a solid education but to work with someone aware of and sensitive to their individual needs. I am such a person and will always strive to be the best educator that I can be.

Reference: Hicks, S. (2010, March 24). "Philosophy" Of "Education". Lecture.

3. The Third Week Blog Post Prompt

This week's prompt is about the love of science

What Questions

- What kind of students do you think you will have? (science love)
- How do you think the majority of students feel about science?

So What Questions

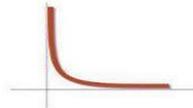
- What does all this mean for you as a science teacher?
- How do you think the love of science affects learning science?

Now What Questions

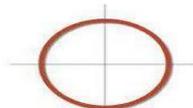
- How would you bring your love of science into the classroom?
- How would you build confidence in your classroom, so that students gain a sense of achievement and, hence, a love of science?
- What was your story about science? Have you always loved science or has it changed at some point in your education? If so how?

ALL YOU NEED IS

$$y = \frac{1}{x}$$



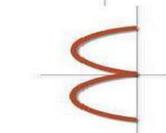
$$x^2 + y^2 = 9$$



$$y = |-2x|$$



$$x = -3|\sin y|$$



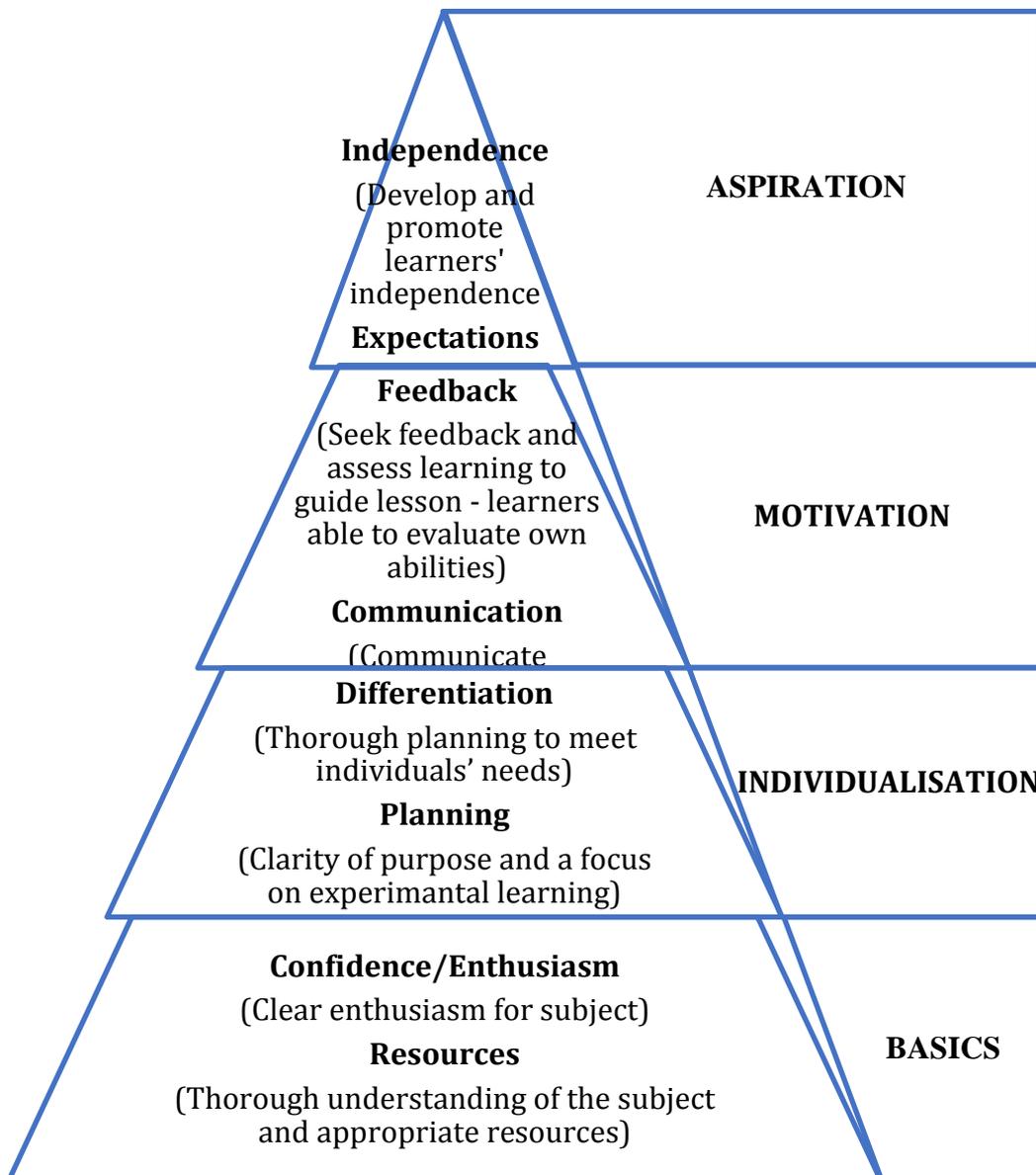
4. The Forth Week Blog Post Prompt

This week's prompt is about pedagogical content knowledge.

What is Pedagogical Content Knowledge?

PCK (Pedagogical Content Knowledge) is a part of content-knowledge (Hashweh, 2005). According to Shulman (1986), is 'the particular form of content knowledge that embodies the aspects of content most germane to its teachability (p.9)

Essentials of PCK: In 2015, Julia Upton created essentials of PCK Piramit as given below.



Blog Questions



What Questions

- How do you think these pedagogy essentials affect students achievements in Math classes?

So What Questions

- Which of these pedagogy essentials do you believe are the most important in a Math class?

Now What Questions

- Do you think you have the necessary pedagogical knowledge and skills to structure an effective Math class? How do you think you can develop your pedagogical content knowledge to become a better Math teacher?

References:

Hashweh, M. Z. (2005). Teacher pedagogical constructions: a reconfiguration of Pedagogical content knowledge. *Teachers and Teaching*, 11(3), 273-292.

Shulman, L. (1986) Paradigms and research programs in the study of teaching: a contemporary perspective, in: M. Wittrock (Ed.) *Handbook of research on teaching* (New York, Macmillan).

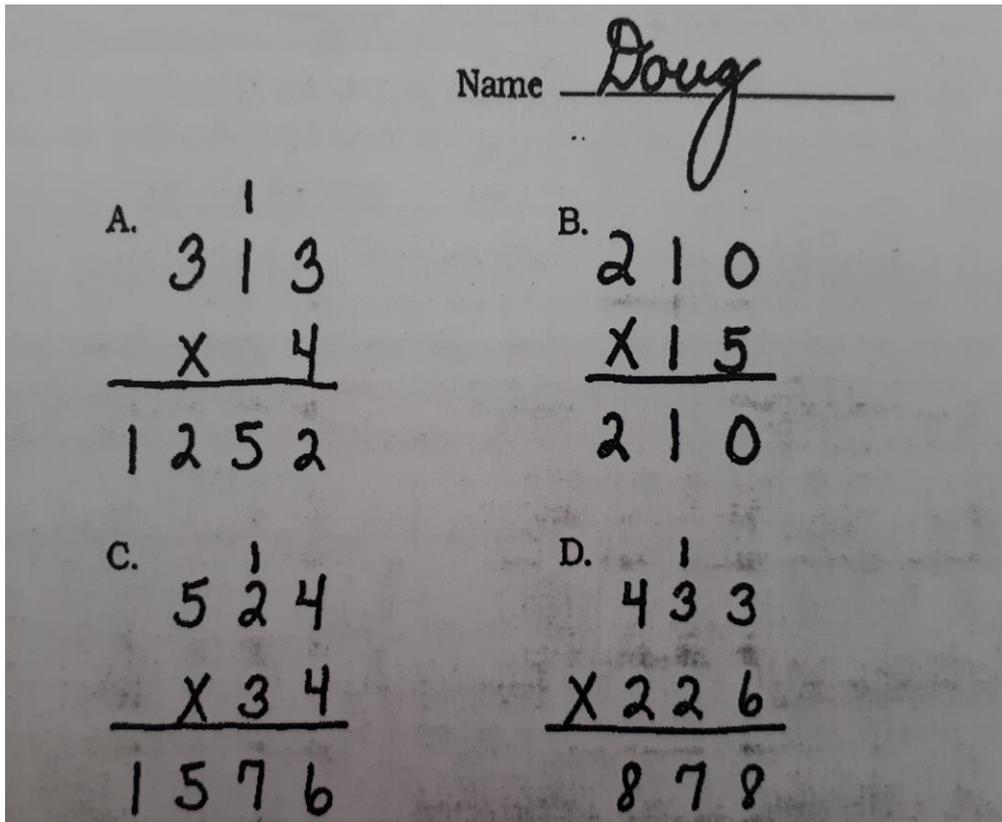
Upton, J. (2014). *Teach Now! Mathematics: Becoming a Great Mathematics Teacher*. Routledge.

5. The Fifth Week Blog Post Prompt

"I must know my song well/before I start singing."

Bob Dylan

This week's prompt is about content knowledge. Please look at the photo before reading the questions.



What Questions

- What is the misconception of the student in the example? And how would you help this student?
- What are the most common misconceptions students have about science?

So What Questions

Thanks to your content knowledge, you could identify the misconception and developed a strategy in your mind to help the student overcome it.



- How do the misconceptions affect science instruction and how do we get rid of the misconceptions?
- What do you think about the importance of science content knowledge for teaching science?

Now What Questions

- How do you feel about your science content knowledge?
- What do you do to develop your science content knowledge?

References

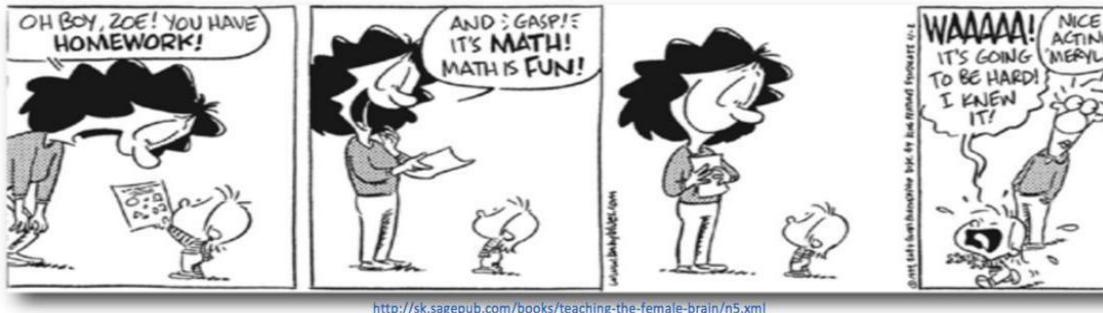
Oldridge, M., & Oldridge, M. (2017, October 21). On The Importance of Mathematical Content Knowledge for Teaching. Retrieved from <https://medium.com/@Matthew>

Oldridge/on-the-importance-of-mathematical-content-knowledge-for-teaching-dfe50d3e2b68

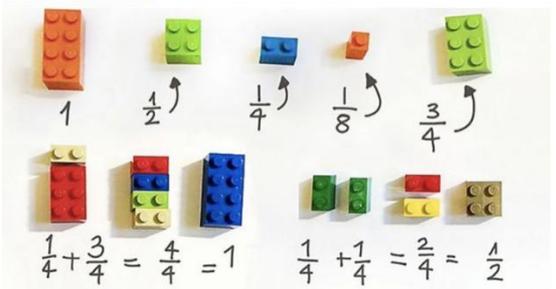
Ashlock, R. B. (2006). *Error patterns in computation: Using error patterns to improve instruction*. Upper Saddle River, NJ: Merrill Prentice Hall.

6. The Sixth Week Blog Post Prompt

This week's prompt is about how students learn. There are some discourses below from the Alfie Kohn's blog page.



“When the process of learning in arithmetic is conceived to be the mere acquisition of isolated, independent facts, the process of teaching becomes that of administering drill.”



https://www.boredpanda.com/cool-math-teach-children-abc-10memes/2/utm_source=social&utm_medium=social&utm_campaign=social

“Math educators are constantly finding examples of how kids can do calculations without really knowing what they’re doing.”

“Mindless mimicry mathematics,” as the National Research Council calls it, has come to be accepted as the norm in our schools.”

“Consider a classroom where third graders open their math textbooks to the contrived “word problems” on page 39. (“A train leaves Washington,

D.C. heading west at 65 m.p.h....”) Now imagine a classroom where students are asked to compare the weight of two pieces of bubblegum (with and without sugar) before and after each piece has been chewed making predictions, recording results, explaining the differences, all the while adding, subtracting, multiplying, dividing, as well as using decimals and percentages, learning to estimate and extrapolate. In which

classroom are they more likely to see math as relevant, appealing, and something at which they can be successful?’’

What Question

- How did you learn Mathematics?
- Can you give one good and one bad example from your experience for effective and ineffective math teaching/learning?

So What Question

- Do you think there is a better way to teach/learn Math?
- If you were to write a book called ‘How students learn Math’ what would you talk about in that book?

Now What Question

- What kind of a Math teacher do you think you are going to be? A teacher who adopts a traditional or a non-traditional approach to teaching math? Why?

References

What Works Better than Traditional Math Instruction. (2015, August 14). Retrieved from <https://www.alfiekohn.org/article/works-better-traditional-math-instruction/>

7. The Seventh Week Blog Post Prompt

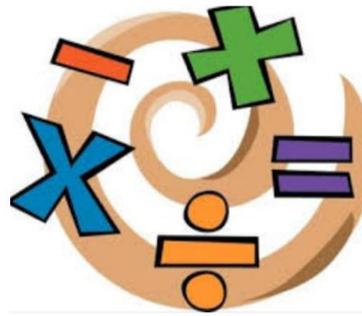
This week's prompt is about diversity in an educational setting.

Building opportunities for all students to achieve in mathematics is important both for the individuals currently excluded from such opportunities and also for mathematics classrooms and for society at large.

Herzig, A. H. (2005). Goals for Achieving Diversity in Mathematics Classrooms. *Mathematics Teacher*, 99(4), 253-259.

What Questions

- What is multicultural teaching?
- How do you define diversity in mathematics classrooms?
- When you think about your own case, after your graduation, what kind of classroom do you think you will have in terms of diversity?



<https://www.thinklink.com/icon/845373144128937963>

So What Questions

- How do you think diversification relates to teaching and learning mathematics?
- How do you think having students with diverse background would affect your teaching?

Now What Questions

Before respond now what question, you can scan the table given below to have a concept on your mind.

- How can a teacher teach mathematics in a culturally responsive way?

Thing You Can Do to Teach Well in a Culturally Diverse Classroom		
Be descriptive on your goals and beliefs in educating different students in mathematics because they have a significant effect on your efforts.	Enrich all students' learning through expanding perspectives and approaches.	Recognize and get closer to the communities your students live in to know more as individuals.
Use the information you gathered about their personality to cover the real interests of the students in the curriculum by placing content-specific skills and interests.	Apply rich learning opportunities that prepare <u>all</u> students for university.	Assess your students' understanding by authentic opportunities, not by confounding other skills or distractors.

References: Herzig, A. H. (2005). Goals for Achieving Diversity in Mathematics Classrooms. *Mathematics Teacher*, 99(4), 253-259.

8. The Eight Week Blog Post Prompt

This week's prompt is about a digital generation.

What Questions

- Who are the digital natives?
- What are the differences between today's kids and you? (*Hint: Because of this hyperconnectivity, your students will learn differently than you did. It's important that you understand how they learn and interact with the world to teach more effectively (Jukes, et al., 2010)*)

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"I appreciate the text, Kate, but next time you can just raise your hand."

<https://jarrucuban.wordpress.com/2011/10/28/digital-kids-in-schools-cartoons/>

So What Questions

<p><i>the digital generation are students who are growing up constantly connected to the world around them through smartphones, tablets, and computers.</i></p> <p>https://study.com/academy/lesson/understanding-and-teaching-the-digital-generation.html</p>	 <p>https://luk-norton.com/norton-blog/2016/02/toddlers_and_technol.html</p>
--	---

- What do you think it is like to teach digital natives?
- What kind of problems do you think you will face when you start teaching to digital natives?

Now What Questions

- How do you think you can appeal to the new the digital world and the new mindset of your students in your math classes?
- How do you assess your comfort level in teaching digital natives?

Reference: Jukes, I., McCain, T., & Crockett, L. (2010). *Understanding the digital generation: Teaching and learning in the new digital landscape*. Corwin Press.

9. The Ninth Week Blog Post Prompt

This week's prompt covers all the prompts that you have written on. It is expected you to read the trinity and answer the questions created by Maura Sellars herself given below.

The Holy Trinity for Teachers

Components	Ways in which this might realistically be achieved
<p>Know yourself and how this self-knowledge impacts on your professional self.</p>	<p>Have a good understanding of your values, attitudes and belief systems. Be aware of your understanding of moral and ethical matters and decision-making strategies.</p> <p>Have sound accurate knowledge of your relative strengths and limitations on an ongoing changeable basis.</p> <p>Identify the characteristics that you would associate with your teacher identity and be prepared to develop, change and remodel in response to changing context and circumstances.</p> <p>Be aware of your profile in the public view as a representative of your profession. Be critical reflective...</p>
<p>Know your content and how to teach it.</p>	<p>Have sound basic knowledge of what you are teaching and be prepared to build on it by accessing further new or more complex notions.</p> <p>Know the pedagogical approaches associated with your content areas.</p> <p>Be prepared to be flexible and to adapt or adopt an alternative, appropriate pedagogical approach to suit changing circumstances or contexts.</p> <p>Know how to teach your content to groups of diverse students (culturally, socially, and individually diverse).</p> <p>Keep up to date with technology and how to use it effectively</p>

	to enhance students' learning in your content areas.
Know your students and how they learn.	<p>Know your students' learning preferences, their relative strengths and limitations on an ongoing changeable basis.</p> <p>Know how to assess each of them to allow them to demonstrate what they know and where they would like/need to go next to their development and learning.</p> <p>Know the interests of your students and their families as they relate to your professional work.</p> <p>Know their communities and their family beliefs, values and preferences as they relate to your professional work.</p> <p>Engage systematically with each student on an individual basis to discuss their learning.</p> <p>Allow students to express their point of view.</p> <p>Understand their choices and why they made them.</p>

What Question

- What do you think of The Holy Trinity for Teachers? Does it make sense to you? Why?

So What Question

- How can using a framework like The Holy Trinity for Teachers affect the way you teach as a teacher?

Now What Question

- What is your Holy trinity for being a good Math teacher?

When you hold the hearts and minds of young children in your hands every single day, winging it is not an option. You need to be ready—with a plan.



Reference

Sellars, M. (2017). *Reflective practice for teachers*. Sage.

10. The Tenth Week Blog Post Prompt

This week's prompt is again about the philosophy of education. You do not need to read the “Sample Educational Philosophy Statement” below. It is just a guide to help you to understand how to respond to the given questions if you need a sample. Other than that, you are free to answer them as you wish.

What Questions

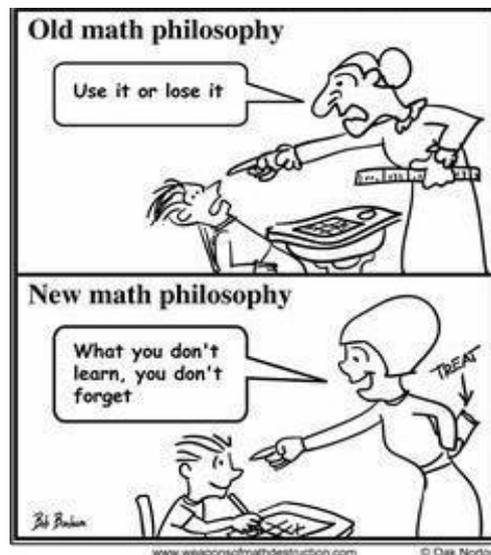
- What is the purpose of education? How do you define it?
- What responsibilities do you have as a teacher?
- How do you think children learn math?

So What Questions

- How will your beliefs about the ‘what questions’ part affect your teaching? Explain them;
 - o In terms of classroom management
 - o In terms of instructional strategies
 - o In terms of curriculum design
 - o In terms of assessment of learning
- What are your goals for your students?

Now What Questions

- Considering your beliefs and their effect on your teaching, what actions should you take to become a better teacher? Or what kind of preparation should teacher education offer?



B. EARLY TEACHER IDENTITY MEASURE

This study was conducted by Amine Merve Ercan at METU Educational Sciences Department. This study aims to determine the teacher identity of pre-service elementary mathematics teacher candidates. The identity information will not be shared with anyone in any way, and the collected data will be kept clear of identity after being edited. If you would like more information about this study, it will be requested from her/him to contact us using the contact information below.

Our respect,

Amine Merve Ercan

Educational Sciences Department

The Faculty of Education Middle East Technical University, Ankara

e-mail: ercan.merve@metu.edu.tr

0 531 638 77 58

Subject Information

Your department:

Year:

Semester:

Age:

Gender:

Did you graduate from a teacher Anatolian high school?

Yes	No
-----	----

There is 17-items Likert scale given below to assess participants' perceptions of their early development of teacher identity. Items assessed on a 5 point Likert scale as followings;

- 1= Disagree
- 2=Disagree Somewhat
- 3=Neutral
- 4=Agree Somewhat
- 5=Agree

	5	4	3	2	1
Family and friends often look to me when it comes to caring for or working with children/adolescents.					
Helping a child learn something new is very rewarding.					
I am a natural teacher.					
I am confident that I will develop the resources and strategies necessary to be a good teacher.					
I am satisfied with the progress I am making in my teacher education.					
I can easily see myself working with children/adolescents and helping them to learn and develop.					
I enjoy helping children discover and learn.					
I enjoy helping out with children's activities.					
I feel comfortable identifying myself as a teacher.					
I find it difficult to see myself in charge of teaching a group of children/adolescents.					
I have confidence in my ability to one day be a good teacher.					
I have no idea what it means to be a good teacher.					
I look for opportunities to work with children/adolescents in my own time.					

I often doubt if I am the right person to become a teacher.					
I often doubt my ability to be a good teacher.					
I see myself as a teacher (either currently or one day).					
If I had more time to volunteer my services, I would choose to work with children.*					

C. GÖRÜŞME PROTOKOLÜ (TURKISH INTERVIEW PROTOCOL)

Title: Pre-Service Mathematics Teachers' Professional Identity Development Through Online Anticipatory Reflections: An Intervention Study

Amine Merve Ercan

Educational Sciences Department

The Faculty of Education

Middle East Technical University, Ankara

Contact: ercan.merve@metu.edu.tr ,+90 531 638 77 58

Katılımcı:

Hangi okuldan mezunsun?

Tarih:

Saat:

Dear Teacher Candidate,

This study was conducted by Amine Merve Ercan at METU Educational Sciences Department. This study aims to determine the role of ICT and social media tools as reflection platforms on elementary mathematics teacher candidates' development of teacher identity. We would like to ask you questions on your professional identity development. Please think about your perceptions on your personal history, academic life and future professionalism in answering these questions.

Your responses are confidential and will be used only for research purposes. We would like to record this interview if it is OK with you. The records will be kept strictly confidential and will only be used for scientific research purposes. The identity information will not be shared with anyone in any way, and the collected data will be kept clear of identity after being edited. The duration of the interview is the maximum of one hour. If you feel uncomfortable at any stage of this process, you can cancel the interview and ask the recording to be erased.

Do you have any questions? If not, I would like to start. I expect that the interview will take about an hour.

Görüşme, 7 kısımdan oluşacaktır ve kişisel bilgilerinizle ilgili birkaç soru ile başlayacağız.

Bir Rol-model Olarak Öğretmen

1. Sence iyi bir öğretmenin özellikleri nelerdir?
2. Öğretmenliği bir meslek olarak seçmeye seni iten bir rol-modelin var mıydı? Varsa kendisinden bahseder misin?
3. Bu rol model seni nasıl etkiledi?
4. Bu rol model seni neyden ötürü etkiledi?

Toplumdaki Yansıma

1. Sence toplumun öğretmenlik mesleğine bakışı nasıl olmalıdır?
2. Yaşadığın ülkede öğretmenlik mesleğinin sahip olduğu statü hakkında ne düşünüyorsun? Öğretmenliğin yüksek/orta/düşük seviyede bir statüye sahip oluşunun arkasında yatan nedenler sence neler? Bu nedenler statüyü nasıl etkiliyor olabilir?

İçsel Yansıma

1. İleride kendini matematikle ilgili bir nasıl bir konumda hayal ediyorsun? İleride bir matematik öğretmeni olarak çalışmak istiyor musun? Neden?
2. Kendini öğretmen olarak tanımlayabiliyor musun?
3. Bana bir öğretmen adayı olarak eğitim felsefeni tanımlayabilir misin?
4. Sence insanlar en iyi nasıl öğrenirler? Neden?
5. Şu an bir üniversite öğrencisisin. Bir öğrenci olarak kendin için belirlediğin bir takım öğrenme yöntemlerin var. Sence bu yöntemler ileride senin öğretme yöntemlerine nasıl yansıtacak?
6. Kendini bir öğretmen olarak sıklıkla hayal eder misin?
 - a. (Evet ise) Nasıl hayal ediyorsun? Neler kendini böyle hayal etmene sebep oluyor? Şu an bir öğretmen adayı olarak seni en çok tatmin eden şey nedir bunları hayal ederken?
 - b. (Hayır ise) Neden? **Katılımcıya kendisini hayal etmesi için biraz süre ver.** Nasıl hissettin? Sence neler kendini böyle hayal etmene sebep oldu? Şu an bir öğretmen adayı olarak seni en çok tatmin eden şey nedir bunları hayal ederken?
7. Şimdi, üniversiten tarafından sana sunulan eğitimi ele almanı istiyorum, özellikle de Eğitim Fakültesi ve kendi bölümünün kültürünü. Bu eğitim sana nasıl roller ve kişilikler yükledi?
8. Şu an bir eğitim fakültesi öğrencisisin ve öğretmenlik mesleğini için hazırlanma aşamasındasın. Bu aşamayı gelişim aşaması olarak ele alırsak, sence kendi kişisel hayatından nasıl unsurlar senin bu gelişim aşamasını pozitif ve negatif olarak etkiliyorlar?
9. İleride çocuklara matematik öğretecek olmak sana kendini nasıl hissettiriyor?
10. (Eğer öğrenci anadolu öğretmen lisesi mezunuysa) Lise eğitiminde ne gibi zorluklarla karşılaştın?

11. Üniversite eğitiminde ne gibi zorluklarla karşılaştın?

Alan Bilsisi

1. Bir öğretmen adayı olarak hiç kendini alanında yetersiz hissettiğin durumlar oldu mu?
2. Korkuların var mı? Bu korkuları tanımlar mısın? Bu korkuların alan bilginle ne kadar ilgili?
3. Sence bir öğretmen kendisini ne zaman tatmin olmuş hisseder?
4. Bana biraz üniversitede edindiği pedagoji bilgisi ve alan bilgisi hakkındaki görüşlerinden bahseder misin?

Öğretmen Kimliği

1. Öğretmenliği nasıl tanımlarsın? Öğretmen nedir?
2. Bir öğretmeni öğretmen yapan unsurlar nelerdir?

Süreç

1. İlk görüşmeyi yaptığımız an ile şu an arasında öğretmen, öğretmenin toplumdaki saygınlığı ve öğretmen kimliğine yönelik görüşlerinde farklılıklar oldu mu? Ne gibi farklılıklar oldu? Neler bu farklılıklara neden oldu?
2. Bu dönem boyunca neler senin öğretmenliğe yönelik profesyonel gelişimini etkiledi?
3. Reflection yazmanın sana ne gibi katkıları ya da deavantajları oldu?
4. Reflectionlarını public ve digital bir ortamda paylaşmanın herhangi bir farklılık yarattığını düşünüyor musun? Düşünüyorsan ne gibi farklılıkları bunlar?
5. Sence her öğretmen reflection yamalı mı?
6. En çok hangi reflectionı/ları yazarken zorlandın? Sence neden?
7. Yazdığın konular arasında hangileri her öğretmenin üzerine düşünmesi gereken konulardı?
8. Haftalık reflectionları sen hazırlayacak olsaydın neleri eklerdin ya da neleri çıkartırdın?
9. Tüm bu süreçle ilgili eklemek istediğin bir şeyler var mı?

D. CODE BOOK

How pre-service teachers see themselves as a teacher		
Code	Description	Example
Pedagogical expert	<p>Expressions demonstrate the pre-service teachers' belief about the importance of health and strong communication with students, teacher-student relationship, a teacher's awareness about cultural and generic differences of students are coded as the pedagogical expert.</p> <p>Additionally, pre-service teachers' strategies emphasizing teachers' abilities to support students' social-emotional and moral development were also considered under this code.</p>	<p>“Bence iyi bir öğretmen öğrencilerini tanımalı en başta.”</p> <p>“I think, a good teacher should first know his/her students.”</p>
Didactical expert	<p>Expressions of pre-service teachers' beliefs about the importance of teaching process, the role of teacher, methods of teaching, educational philosophy were coded as the didactical expert. Additionally, pre-service teachers' expressions emphasizing teachers ability to plan a lesson and execution of it</p>	<p>“İlköğretim çocukları için biraz daha böyle eğlenceye yönelik şeyler yapıldığında onları daha fazla derste tutabiliriz diye düşünüyorum. Mesela her konu için değişik etkinlikler ve aktiviteler ya da oyunlar tasarlamak onların</p>

	were also considered under this code.	anlamasını inanılmaz kolaylaştırır.”
		“I think that when some more fun-related activities are prepared for elementary school kids, we can keep them more engaged in lessons. For example, designing different activities or games for each topic makes it easy for them to understand.”
Subject matter expert	Expressions demonstrate the pre-service teacher’s level of ability to convert mathematical knowledge into teachable knowledge is coded as subject matter expert. Beliefs of pre-service teachers about curriculum preparation, realising student’s understanding of maths, and misconceptions concerned under this code. Other issues concerning the subject area and love towards math also handled under this coding.	“... O soruyu mesela yanlış işaretlemiş olabilir ama ben onun çözümünü onun mantığını anlıyorsam eğer, evet. Benim için bu daha önemli. Hani ben öyle düşünüyorum.” “...for example, he/she might have marked that question incorrectly, but if I understood his/her logic, yes. This

is more important to me. I think so.”

Affordances of the intervention for teacher identity development

Facilitated thinking	Expressions indicating that the process prompted pre-service teachers to think on or to criticize educational issues related to being a teacher and teaching.	“Yani bilmiyorum bence faydalı oldu bu yani çünkü düşünmemi sağladı o konuda mesela şu zaman kadar hiç düşünmemiştim.” “Well I don’t know, I think it was beneficial since it made me think about that.”
Facilitated awareness	Expressions indicating that after the thinking process, the intervention made pre-service teachers realise their existing understanding of ideas, feelings and who they are as a teacher.	“Ben birçok şeyi hani orada (blog yazma aşamasında) fark ettim.” “I realised many things during that time (in the process of blogging).”
Promoted new perspectives	Expressions indicating that after the awareness process, the intervention made pre-service teachers change their existing understanding of ideas, feelings and who they are as a teacher or widen their perspective.	“Birkaç kişininkini okudum ve böyle, insanlar gerçekten iyi şeyler yazmış. Onları görünce benim de ufkumun geliştiğini düşünüyorum.”

		<p>“I read some of the others (reflections) and people have written really good things. When I see such things, I think my horizon also expands.”</p>
Facilitating internalization of teacher identity	<p>Expressions indicating that due to the intervention pre-service teachers internalized being a math teacher more than before. They believed that the intervention had changed their teacher identity.</p>	<p>“Ben öğretmenim. Bunu ne kadar içselleştirebildiğimi blog yazarken çok hissettim.”</p> <p>“I am a teacher. I realized how much I internalized that as I write blogs.”</p>
Pre-service teachers’ feedbacks about the intervention		
Satisfaction	<p>Expressions indicating satisfaction, positive thoughts and feelings towards the weekly anticipatory reflective writing process and indication the benefits of the process were coded as satisfaction.</p>	<p>“...ben faydalı buldum...”</p> <p>“...I found it beneficial...”</p>
Workload	<p>Expressions about the feeling tired because of the workload of the intervention were considered under this code.</p>	<p>“...her hafta yazmak çok yordu beni.”</p> <p>“... Posting every week was tiresome.”</p>

Suggestion	Any suggestion came from pre-service teachers to develop the intervention.	“Başka bir yazıyla ilgili bir yorum mesela yapma zorunluluğu olabilir.” “Maybe, commenting on another reflection might be obligatory.”
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E. TURKISH SUMMARY / TÜRKÇE ÖZET

HİZMET ÖNCESİ MATEMATİK ÖĞRETMENLERİNİN ÇEVİRİMİÇİ GELECEĞE DÖNÜK YANSITICI YAZILAR YOLUYLA PROFESYONEL KİMLİK GELİŞİMİ: BİR MÜDAHALE ÇALIŞMASI

1. Giriş

Öğretmen yetiştirme programları, öğretmen adaylarına sınıfta başarılı bir öğretmen olmak için gerekli bilgi ve becerileri kazandırmayı ve onlara nasıl öğreteceklerini, nasıl öğreneceklerini, bir sınıfa nasıl yöneteceklerini, eğitimin temellerini ve konu alanına ilişkin bilgileri öğretmeyi amaçlamaktadır. Öğretmen yetiştirme programının sonunda, öğretmen adaylarının teori ve uygulama arasında sağlıklı bir bağ kurması beklenir. Ancak mesleğin ilk yıllarında öğretmenler bununla ilgili zorluklar yaşayabilir, bu durum öz yetersizlik ve başarısızlık hissine neden olabilir. Bu nedenle, öğretmenlik mesleğine sağlıklı bir başlangıç için öğretmen yetiştirme programları çok önemlidir ve mesleki kimliğin gelişimi bu geçişin ana faktörüdür (Beauchamp ve Thomas, 2014).

Araştırmalar, acemi öğretmenlerin yaklaşık % 45,0-50,0'sinin ilk beş yıl içinde mesleği bırakmaya eğilimli olduğunu göstermiştir (Ingersoll & Smith, 2003). Ek olarak, bu nitelikli öğretmenler arasında, en fazla bırakma eğiliminin mesleğe yeni başlayan ortaokul matematik ve fen öğretmenlerinde olduğu gösterilmiştir (Ingersoll, 2001; Henke ve diğerleri, 2001). Alanyazın taraması göz önüne alındığında, öğretime geçişte güçlü bir öğretmen kimliğine sahip olmanın bu eğilimi azalttığı görülmektedir (Alsup, 2006; Britzman, 2003). Bu nedenle bu çalışma, öğretmenlik mesleğine başlama aşamasından önce ortaokul matematik öğretmen kimliğinin gelişimini ve geleceğe yönelik yansıtıcı yazıların bu gelişime etkisini ele almaktadır.

20. yüzyılın sonlarında artan kimlik çalışmaları ile birlikte öğretmen kimliği eğitim literatüründe popüler bir terminoloji haline gelmiştir (Akkerman ve Meijer, 2011). Öğretmen kimliği bir kimlik türü olarak, 'öğretmen kimliğinin gelişimi' ise 'öğretmen olarak ben kimim, kim olmak istiyorum gibi soruların farkında olmak' olarak tanımlanır (Kelchtermans & Hamilton, 2004; Korthagen & Vasalos, 2005).

Kimlik gibi, öğretmen kimliği için de mevcut ortak bir tanım yoktur (Izadinia, 2013; Beijaard ve ark., 2004). Bazı araştırmacılar, öğretmen kimliğinin, bir öğretmenin öğretim ve öğretmen olma konusundaki inançlarının toplamı olduğunu öne sürerken (Walkington, 2005); diğerleri bunu bir öğretmenin mesleki statüsü (Gee, 2001), sosyal konumu (Olsen, 2008) ya da öğretmenin başkalarıyla etkileşim ve deneyimlerinin yorumlanmasının bir ürünü olarak tanımlamaktadır (Gee, 2000; Geijsel ve Meijers, 2005; Olsen, 2008; Slay ve Smith, 2011; Sutherland, 2009). Özetlemek gerekirse, öğretmen kimliği; ‘kendisi veya başkaları tarafından öğretmen olarak tanınmak/sayılmak’ olarak tanımlanabilir (Luehmann, 2007).

İyi gelişmiş bir öğretmen kimliği, öğretmenin pedagojik uzmanlığına, didaktik uzmanlığına ve konu uzmanlığına bağlıdır. Bu tür bir kimlik tanımı, sadece bir öğretmen olarak etikete sahip olmanın değil, aynı zamanda öğretim konusunda kavramsal bir anlayışa ve iyi yapılandırılmış bir öğretmen kimliği için nitelikli öğretim becerilerine sahip olmanın da altını çizmektedir (Beijaard ve diğerleri, 2000). Literatüre göre, mesleki gelişim üzerine yansıtıcı yazı yazmak öğretmen kimliği üzerinde olumlu etkilere sahiptir (Frechtling, ve ark., 1995). Yansıtıcı yazılar üzerine yapılan çalışmaların ortak noktası, yansıtıcı yazıların yeni öğretmenlere özellikle eğitimci olarak kendi konumlarını keşfettirdiğini ve öğretmen tanımı konusunda güçlü fikirler oluşturduğunu iddia etmeleridir (Rushton, 2004). Yansıtıcı yazının en temel noktası, tecrübesiz öğretmenlere mesleklerinde önemli değişiklikler yapma konusunda bir rehber olmasıdır; bir süre sonra yansıtıcı yazı yazma eylemi, onların öğretimleri hakkında daha aktif düşüncelerini ve karşılaştıkları sonuçların neden beklenen sonuçları karşılayamadığını analiz etme becerisi sağlamaktadır (Schön, 1990).

Mezirow (1998) yansımayı; bir düşünce, durum, duygu, davranış, niyet, eğilim veya duyum hakkında farkındalık yaratan deneyime ‘geri dönmek’ olarak tanımlamıştır. Bununla birlikte Conway (2001), yansıtıcı yazının geriye dönük olmak zorunda olmadığını, ileriye dönük de olabileceğini çünkü yansıtıcı yazının öğretmenlere, gelecekteki potansiyel yaşantıları düşünceleri konusunda olanak sağladığını ileri sürmüştür.

Literatürde, araştırmacılar ileriye dönük düşünmeyi bir tür ‘geleceğe yönelik’ yansıtma olarak tanımlarlar. ‘İleriye dönük düşünme/öngörme yansıması’ bir öğretmenin öngörme yeteneğinin gelişmesine, öğretmen kimliğinin güçlenmesine

(Conway, 2001) ve olası sorunları önceden tespit ederek, araştırarak ve değerlendirerek anlamlı kararlar vermesine yardımcı olur (Urzua ve Vasquez, 2008). Gelecek odaklı yansıtıcı yazılar, öğretmenlerin öğretmenlik kimliklerini araştırmalarına ve hizmet öncesi öğretmen eğitimi programlarında mesleki ilerlemelerini görmelerine olanak sağlar (Chen, 2018).

1.1. Araştırma Soruları

Bu çalışma, çevrimiçi ileriye dönük yansıtıcı yazılar yoluyla hizmet öncesi eğitim sırasında ortaokul matematik öğretmeni kimliğinin gelişimi hakkında fikir edinmeyi amaçlamaktadır. Daha spesifik olarak aşağıdaki araştırma sorularına cevap aranmıştır;

- 1- Matematik öğretmen adayları mesleki kimliklerini nasıl algırlar?
- 2- Haftalık çevrimiçi geleceğe dönük düşüncelerin öğretmen adaylarının mesleki kimlik gelişimi üzerinde nasıl bir etkisi vardır?
- 3- Çevrimiçi “profesyonel benlik” üzerine düşünmek, matematik öğretmen adaylarının mesleki kimlik gelişimini nasıl etkiler?

1.2. Çalışmanın Önemi

Öğretmenlerin kimlik anlayışı, eylemlerinin temelini oluşturur (Kelchtermans, 2005). Bu nedenle, kendi mesleki kimliklerinin daha kapsamlı bir şekilde anlaşılması, öğretmenlerin mesleklerindeki birçok zorluğu yenmelerine yardımcı olabilir (Titu, 2019).

Palmer (2006), bir öğretmenin öğrencilerini tanıyabilmesi için önce kendisini tanıması gerektiğini vurgulamıştır ve güçlü bir şekilde içselleştirilmiş öğretmen kimliğinin tüm iyi öğretmenlerin ortak bir özelliği olduğunu öne sürmüştür. Kimlik, nasıl öğretmen olunacağı ve nasıl davranılacağı konusundaki fikirlerinin inşasında öğretmenler için bir çerçeve sağlar; güçlü bir kimlik, bir öğretmenin zorluklarla mücadele etme, beklentileri karşılama ve mesleğin karmaşıklıklarının üstesinden gelme konusunda ona yol gösterir. Dolayısıyla bu çalışmanın sonuçları öğretmen

adaylarının daha güçlü ve içselleştirilmiş kimliklere sahip olabileceklerini anlamak açısından faydalıdır (Thomas ve Beauchamp, 2007, s.178).

Ayrıca öğretmenler mesleğe güçlü bir mesleki kimlik duygusuyla başlayamazlarsa, kendilerini başarılı, tatmin olmuş hissedemezler ve bu durumda öğretmenliği bırakmaya eğilimlerini tetiklenebilir (Alsup, 2006; Canrinus ve ark., 2011). Bu anlamda öğretmen eğitimi sırasında öğretmen kimliği gelişiminin nasıl destekleneceğini araştırmak önemlidir.

Literatürdeki araştırmalar öğretmen adaylarının kimlik gelişimine yansıtıcı yazmanın olumlu etkilerini göstermektedirler (Alsup, 2006; Arpacı-Somuncu, 2016; Djoub, 2018; Durmaz ve Yiğitoğlu, 2017; Graham ve Phelps, 2003; Koca, 2016; Tok, 2008; Yaşar, 2016; Yaylı, 2012). Bununla birlikte literatür, hizmet öncesi aşamada yansıtıcı yazı yazma yöntemiyle yapılacak daha fazla müdahale çalışmasına ihtiyaç duyulduğunu vurgulamaktadır (Aslan, 2018; Alsup, 2006; Djoub, 2018; Graham ve Phelps, 2003). Özellikle Türkiye'de matematik öğretmen adaylarının kimlik gelişimini destekleye yönelik müdahale çalışması örnekleri oldukça sınırlı sayıdadır. Dolayısıyla bu çalışmanın sonuçları, matematik öğretmeni adaylarının kimliğini desteklemek için tasarlanmış bir müdahalenin bulgularını ve katılımcı öğretmen adaylarının müdahalenin etkililiğine ilişkin algıları ile ilgili veriler sunarak mevcut literatüre katkı sağlamıştır.

Ayrıca, bu çalışma, matematik öğretmen adaylarının kimlik gelişimini desteklemek için yansıtıcı müdahale programları tasarlamak isteyen araştırmacılara bir örnek olabilir. Öğretmen kimliği gelişiminde çevrimiçi yansıtıcı yazmada etkili uygulamalarının önemini altını çizen bu çalışma, öğretmen eğitimcileri ve öğretmen eğitim programları için öğretmen adaylarının kimlik gelişiminin nasıl teşvik edileceğine dair de bazı içgörüler sunabilmektedir.

1.3. Teorik Çerçeve

Bu çalışma, öğretmen kimliğinin bileşenlerini ve etkileyen faktörleri kategorize eden ve Beijaard, Verloop ve Vermunt (2000) tarafından geliştirilen bir teorik çerçeveye dayandırılmıştır. Bu çerçevede öğretmenin profesyonel kimliği üç ana öğretmen bilgisi türü altında tanımlanmıştır: konu uzmanı olarak öğretmen,

pedagojik uzman olarak öğretmen ve didaktik uzman olarak öğretmen. Dahası, bu çerçevede, öğretmenlerin kimliğinin üç ana dış faktör tarafından şekillendirildiğini göstermektedir: öğretim bağlamı, öğretim deneyimi ve öğretmenin biyografisi (Beijaard ve diğerleri, 2000).

2. Çalışmanın Deseni

Bu çalışma haftalık çevrimiçi geleceğe dönük yansıtıcı yazmanın matematik öğretmen adaylarının mesleki kimlik gelişimi üzerindeki etkisini araştırmak için nitel ve nicel metodolojilerin birleştirildiği karma yöntemli bir çalışmadır.

Karma yöntemler, zamanlamaya göre sıralı ve eşzamanlı olarak sınıflandırılır (Morse, 1991). Bu çalışmada nicel ve nitel veriler aynı anda toplanmış ve analiz edilmiştir. Dolayısıyla, bu çalışma eş zamanlı bir karma yöntem çalışmasıdır. Ayrıca bu çalışmada hem nitel hem de nicel verilerin odağı farklı araştırma sorularıdır. Yani nitel ve nicel verilerden elde edilen sonuçlar farklı araştırma sorularının cevaplanması için kullanılmıştır. Nicel veriler, ilk araştırma sorusunu cevaplamak için kullanılırken, nitel veriler çoğunlukla ikinci ve üçüncü soruları cevaplamada kullanılmıştır. Böylece nitel ve nicel yöntemler eşit önceliğe sahip olacak şekilde tasarlanmıştır; çalışma eşit ağırlıktadır. Creswell ve Clark (2006) 'a göre, karma yöntemli bir çalışma eşit ağırlıkta eşzamanlı olarak yürütülürse, tasarım türüne üçgen karma yöntem olarak adlandırılmaktadır; üçgen karma yöntemde, bulgular yorumlama veya analiz aşamasında karıştırılır. Bu çalışmada da nitel ve nicel verilerden elde edilen sonuçlar yorumlama aşamasında karıştırılmışlardır.

İkinci araştırma sorusu için tek gruplu ön test-son test yarı deneysel desen kullanılmıştır. Tek gruplu ön test-son test yarı deneysel tasarım, genellikle aynı katılımcı grubunun (31 matematik öğretmeni adayı) aynı bağımlı değişkeni (öğretmen kimliği) müdahaleden önce ve sonra ölçüldüğünde (çevrimiçi ileriye dönük yansımalar) kullanılır (Campbell & Stanley, 1966).

Birinci ve üçüncü araştırma soruları için ise tematik analiz yaklaşımı benimsenmiş ve tematik kodlama yapılmıştır. Literatürde bazı çalışmalar (örneğin Aronson, 1994; Boyatzis, 1998; Kogan ve ark., 2011; Ryan ve Bernard, 2000) tematik analizi niteliksel bir yöntem olarak kabul etmektedir; ancak bazı yayınlarda (örneğin

Braun ve Clark, 2006; Given, 2008; King, 2004; Leininger, 1992; Tanaka ve ark., 2012; Tanaka, 2000) sadece bir yöntemden ziyade bağımsız bir nitel yaklaşım olarak da ele alınmıştır. Braun ve Clarke'ın (2006) tanımına dayanan bu çalışmada, tematik analiz nitel bir yaklaşım olarak benimsenmiş ve hem ikinci hem de üçüncü araştırma soruları için kullanılmıştır.

Braun ve Clarke'a (2006) göre, tematik analiz yoluyla, veri temelerindeki örüntüler iki şekilde tanınabilir: tümevarımsal ve tümdengelimsel. Veri kodlaması, önceden var olan bir çerçeve veya anlayışı kullanarak bir model oluşturmak için gerçekleştirilirse, tümdengelimsel yol seçilir. Bu tür bir veri analizi, kodlarını temellenmiş bir teoriden alır. Öte yandan tümevarımsal tematik analizde kodlar kodlama aşamasında ortaya çıkarlar. Tümevarımsal analizde, herhangi bir çerçevenin ötesinde, daha derin bir kodlar yakalanabilir. Tematik analiz yönteminin seçimi, kodlama nedenine göre yapılmalıdır.. Bu çalışmada, hem birinci hem de üçüncü araştırma soruları tematik analiz yoluyla incelenmesine rağmen, birinci soru Bejiaard ve ark. (2000) tarafından geliştirilen çerçevede göre analiz edilirken, üçüncüsünün kodları verilerin kendisinden ortaya çıkmıştır. Böylece, birinci soru için tümdengelimsel tematik analiz yapılırken, üçüncü araştırma sorusu Braun ve Clarke'ın (2006) tanımladığı gibi tümevarımsal tematik analiz yoluyla incelenmiştir.

2.1. Örneklem Seçimi

Literatürde, rastlantısal örnekleme genellikle nicel araştırma ile bağlantılıyken, rastlantısal olmayan örnekleme nitel araştırma ile ilişkilendirilmiştir (Onwuegbuzie & Leech, 2005) ancak rastlantısal olmayan örnekleme şemalarının karma yöntemlerde de kullanılmaya uygun olduğu bildirilmektedir (Onwuegbuzie ve Collins, 2007). Bu çalışmada bir rastlantısal olmayan örnekleme yöntemi olarak kolayda örnekleme yöntemi kullanılmıştır.

2.2. Prosedür ve Veri Toplama

Bu müdehale çalışması, Orta Doğu Teknik Üniversitesi (ODTÜ) İnsan Araştırmaları Etik Kurulu'ndan çalışma onayı alındıktan sonra çalışma, ilköğretim

matematik öğretmen adaylarının aldığı zorunlu ders olan Öğretim Teknolojileri ve Materyal Geliştirme Dersi içerisine entegre edilmiştir. Bir dönem boyunca öğretmen adayları bu çalışmaya dahil olmuş ve dönemsonunda çalışmadan bir not almışlardır. Çalışmadan aldıkları not dersten aldıkları notun %10,0'u şeklinde düzenlenmiştir.

Çalışma boyunca Öğretmen adayları ile dünyanın en büyük K-12 sosyal öğrenme ağı olan Edmodo üzerinden iletişime geçilmiştir. Dersin süresi 14 hafta olup bu sürenin ilk haftasında öğretmen adayları müdahalenin prosedürleri hakkında bilgilendirilmiş ve onam formları toplanmıştır. Katılmayı kabul eden öğretmen adaylarına daha sonra yaş, cinsiyet ve eğitim durumu hakkında sorular soran bir demografik anket ve ön test olarak Erken Öğretmen Kimlik Ölçeği (ETIM) verilmiştir. İkinci haftada, haftalık çevrimiçi yansımaların nasıl yapılacağına dair kısa bir sunum yapılması sonrası katılımcılar kendi blog sayfalarını oluşturmuş ve laboratuvar oturumunda yayınlanan ilk gönderilerinde kendilerini tanıtmışlardır.

Üçüncü haftadan itibaren sonraki 10 hafta boyunca, öğretmen adayları ileriye dönük yansıtıcı yazılarını blog oluşturmak için kullanabilecekleri açık kaynaklı bir yazılım olan WordPress'te yayınlamışlardır. Yansıtıcı blog yazıları ödev olarak verilmiş ve öğretmen adayları her yansıtıcı yazma için bir puan almışlar, toplam müdahale ders notlarının %10,0'unu etkilemiştir. Geciken her yayın için bir puan kaybetmişlerdir. Dersin son haftasında ETIM öğretmen adaylarına tekrar uygulanmış, ayrıca gönüllü öğretmen adayları ile bireysel görüşmeler yapılmıştır.

On hafta boyunca öğretmen adaylarına her yansıtıcı yazı için bir yönlendirme yazısı gönderilmiştir. Bu yönlendirme Rolfe ve diğerleri, (2001) tarafından geliştirilen yansıtıcı sorgulama modeline göre hazırlanmıştır. Bu modele göre yönlendirme üç aşamalı sorular içermektedir; 'ne?', 'sonuç olarak ne?' ve 'peki şimdi ne?'

Yönlendirmeler Beijaard ve ark.'nın (2000) öğretmen kimliği çerçevesine dayandırılarak hazırlanmıştır. Çerçeveye göre, öğretmen kimliğinin temelleri olarak kabul edilen konu alanı uzmanlığı, pedagojik uzmanlık ve didaktik uzmanlık olmak üzere üç ana uzmanlık vardır. Bu temalara öğretmen mesleki gelişimi teması da eklenmiş ve çalışmadaki yansıtıcı yazı yönlendirmeleri dört ana tema altında hazırlanmıştır. Her yönlendirme bu temalardan birine atıfta bulunmuştur (Ek A).

İlk hafta, hizmet öncesi aşamada profesyonel öğretmen gelişimi ile ilgili yönlendirme hazırlanmış; bu yönlendirmede, öğretmen adaylarına mesleki gelişimin

ne olduđu, hangi aşamalara sahip olduđu, hizmet öncesi öğretmen eğitiminin bu gelişimi nasıl etkilediđi, acemi öğretmenlerin ne tür endişeleri olabileceđi hakkında düşünmeleri için rehberlik etmeyi amaçlanmıştır. İkinci haftanın yönlendirmesinde, öğretmen adaylarına eğitim felsefeleri üzerine yazılar yazdırılmış, Öğretmen adaylarının varsa eğitim felsefelerindeki deđişimi fark etmelerini sağlamak için aynı yansıtıcı yazma ödevi 10. haftada tekrarlanmıştır. Üçüncü haftada, pedagojik uzmanlık yoluyla matematik sevgisini içselleştirmek hakkında yazı yazmışlardır. Dördüncü haftada ise, matematiđin nasıl öğretiliceđi konusundaki düşüncelerini ilkökul seviyesindeki öğrenci örnekleri üzerinden yansıtmışlar; başka bir deyişle, didaktik bilgileri üzerine düşünmüşlerdir. Beşinci haftada, kavram yanılgılarıyla ilgili yönlendirme alarak, bu hafta alan bilgisi hakkındaki düşüncelerini inceleyip ifade etmeleri için yönlendirilmişlerdir. Altıncı haftada, didaktik uzmanlıkları üzerine bir kez daha düşünmüşlerdir. Yedinci ve sekizinci haftalarda ise, öğretmen adayları ileriye dönük yansıtıcı yazılar aracılığıyla gelecekteki öğrencilerinin özelliklerini düşünmeye yönlendirmişlerdir. Yedinci hafta, öğrenciler arasındaki kültürel çeşitlilik ve bu çeşitlilikten kaynaklanan gereksinimler üzerineyken, sekizinci haftada dijital dünyaya dođacak olan gelecekteki öğrencilerinin ihtiyaçlarını göz önünde bulundurarak dijital çağda yeni nesile nasıl matematik öğretecekleri üzerinedir. Dokuzuncu haftada, öğretmen adaylarının kendileri ve öğrencilerini tanımaları için Maura Sellars (2017) tarafından geliştirilen Kutsal Üçlü, hakkında yansıtıcı yazılar yazmaları istenilmiştir.

2.3. Veri Toplama Araçları

Bu çalışmada, Erken Öğretmen Kimlik Ölçeđi (ETIM) (Friesen ve Besley, 2013) (Ek C) ve veri toplamak için bir görüşme programı kullanılmıştır.

2.3.1. Erken Öğretmen Kimlik Ölçümü

Bu ölçek, Friesen ve Besley (2013) tarafından katılımcıların öğretmen kimliklerinin erken gelişimine dair anlayışlarını ölçmek için geliştirilmiştir. Ölçek, bir (Katılmıyorum) ile beş (Katılıyorum) arasında deđişen ve 17 maddeden oluşan beşli Likert tipi bir ölçektir. Dört madde ters kodlanmıştır. Tüm ölçek üç alt boyut altında

kategorize edilmiştir. İlk alt boyut olan 'öğretmen olarak kendini sınıflandırma', katılımcıların kendilerini öğretmen olarak nasıl tanımladıklarını değerlendiren beş madde içermektedir. İkinci alt boyut olan 'öğretmen olma konusunda kendine güven', katılımcıların başarılı bir öğretmen olmak için gerekli becerileri ve kaynakları geliştirme yetenekleri hakkındaki özgüvenlerini gösteren altı maddeden oluşmaktadır. Üçüncü alt ölçek olan 'çocuklara ve öğretime karşı doğal eğilim' 6 maddeyle değerlendirilmiş ve katılımcıların çocukları eğitmek veya denetlemekle ilgili inançlarını değerlendirmektedir. Ölçünün iç tutarlılık güvenilirliğinin iyi olduğu (alfa = 0,87, düzeltilmiş madde-toplam korelasyonları 0,28 ile 0,74 arasında değiştiği, N = 109) (Friesen ve Besley, 2013) ve test-tekrar test güvenilirliğinin kabul edilebilir olduğu bildirilmiştir (Test 1 alfa = 0,83; Zaman 2 alfa = 0,88; Test 1'den Test 2'ye korelasyon = 0,62, p <0,001. Test 2 alfa = 0,77, düzeltilmiş madde toplam korelasyonları 0,25 ile 0,53 arasında değişmekte; Test 2 korelasyonu = 0,56, p <0,001). Bu çalışmada da ön test ve son test için Cronbach alfa sonuçları yeterli iç tutarlılık göstermiştir (Tablo 2).

Bu araştırmaya katılan tüm katılımcıların ana dili Türkçe, Erken Öğretmen Kimlik Ölçeği'nin dili ise İngilizcedir. Üniversitenin dili %100,0 İngilizce olmasına rağmen dil yeterliliğini test etmek için aynı bölümden üç birinci sınıf ve iki ikinci sınıf öğretmen adayı ile sesli okuma seansları yapılmıştır. Öğretmen adayları, Erken Öğretmen Kimlik Ölçümü'nün her bir cümlesini/bölümünü okuyarak ne anladıklarını Türkçe açıklamışlardır. Elde edilen sonuçlara göre, tüm cümleler çalışmanın yapıldığı üniversitenin ilköğretim matematik eğitimi birinci ve ikinci sınıf öğretmen adayları tarafından anlaşılır ve doğru bir şekilde açıklanmıştır. Bu sayede, ETİM'in çalışmanın örnekleme için uygun olduğu sonucuna varılmıştır.

2.3.2. Görüşme Prosedürü

Öğretmen adaylarının müdahaleye ilişkin bakış açılarını keşfetmek için yarı yapılandırılmış görüşme programları geliştirilmiştir. Kapsamlı bir literatür taramasından sonra ve çalışmanın benimsenen teorik çerçevesi doğrultusunda (Beijaard ve diğerleri, 2000) görüşmelerin ilk taslağı geliştirilmiştir. Tüm katılımcıların ana dili Türkçe olduğu için mülakat Türkçe olarak hazırlanmıştır.

Görüşme programı hazırlanmasının ardından iki farklı üniversiteden üç müfredat ve öğretim uzmanınca revize edilmiştir. Geri bildirimler doğrultusunda bazı sorular kaldırılmış ve bazı soruların ifadeleri değiştirilmiştir. Gerekli değişikliklerin ardından birinci ve ikinci sınıf matematik öğretmen adaylarından beşi ile pilot görüşme yapılmıştır. Pilot çalışmada her öğrenci sadece soruyu cevaplamakla kalmamış, sorulardan ne anladığını da açıklamıştır. Tüm soruların net ve doğru anlaşıldığı görülerek görüşme programının hazırlanış aşaması tamamlanmıştır.

Görüşme programı (Ek D'ye bakınız) iki bölümden oluşturulmuştur. Birinci bölümde demografik sorulara, ikinci bölümde ise öğretmen olma kararının arkasındaki sebepler, okul öncesi dönem inançları ve yaşam deneyimleri gibi kategorilerle ilgili sorulara yer verilmiştir.

2.4. Veri Analizi

2.4.1. Nicel Veriler

İlk olarak düzenli olarak yansıtıcı yazı yazmayan katılımcılardan toplanan veriler elenmiştir. Kalan veriler ($n = 31$) SPSS 24,0 istatistik paket programı kullanılarak analiz edilmiş, ardından örneklem büyüklüğü 50'den küçük olduğu için Shapiro Wilk testi ve tek grupta ön test - son test çalışması yapıldığı için bağımlı örneklem t-testi uygulanmıştır (Ghasemi & Zahediasl, 2012); Shapiro Wilk testi, verilerin çevrimiçi yansıtıcı yazılara ve öğretmen adaylarının öğretmen kimliğine katılımı ile ilgili normal bir dağılım gösterdiğini doğrulamıştır.

2.4.2. Nitel Veriler

Verileri analiz etmek için tematik bir analiz yaklaşımı benimsenmiş ve Braun ve Clarke (2006) tarafından geliştirilen aşamalar takip edilmiştir. İlk olarak verilere "tekrar tekrar dinleme" ile aşina olunmaya çalışılmış, ardından veriler yazılı forma dönüştürülmüştür. İlk kodlamalar, ilk aşamada tekrarlanan dinleme sırasında ve yazıya dökme aşamasında tekrarlanan okuma sırasında yapılmıştır. İkinci olarak, verilerin ne anlama geldiği ve kodlayıcıların bunları nasıl yorumladığına dair bir başlangıç kod

kitabı hazırlanmış; üçüncü olarak ise, kodlar anlamlı temalar altında tekrar düzenlenmiştir. Dördüncü olarak, araştırmada incelenen argümanlara ilişkin temalar gözden geçirilerek temaların yorumsal analizi yapılmıştır. Beşinci aşamada temalar isimlendirilerek sıralanmıştır. Son olarak, temalar içinde; verilerin özü, tutarlılığı, mantığı ve tekrarlılık hesabına bakılarak nihai analiz yapılarak bulgular rapor edilmiştir.

Birinci soruda, araştırmanın dayandığı kapsamlı bir teorik çerçeve olduğu için tündengimsel tematik analiz yöntemi (Braun ve Clarke, 2006); üçüncü araştırma sorusu için ise tümevarımsal tematik bir yaklaşım benimsenmiştir (Braun ve Clarke, 2006). İki farklı kodlayıcı, verilerin aynı %20,0'sini analiz etmiştir. Kodlama şemasının kodlayıcılar arası güvenilirliğini hesaplamak için verilerin %20,0'sinin uyumu Krippendorff's alpha hesaplanmıştır. 0,89 alfa değeri belirlenmiş ve verilerin geri kalanı tek bir kodlayıcı (araştırmacı) tarafından kodlanmıştır.

3. Bulgular

Bu, hem nicel ve hem de nitel veriler içeren bir karma yöntem çalışmasıdır. Matematik öğretmen adaylarının öz-sınıflandırma, öğretmen olma konusunda güven / öz-yeterlik ve çocuklara / öğretime karşı doğal eğilim olmak üzere 3 bölümden oluşan ETIM puanlarına göre kimlik gelişimlerini görmek için nicel yöntemden yararlanılmıştır. ETIM'in geliştiricileri (Friesen ve Besley, 2013) tüm parçaların tek bir boyut olan 'öğretmen kimliği' altında ele alınabileceğini belirtmişlerdir. Ancak müdahalenin etkilerini daha derinlemesine görmek için bu çalışmada hem tüm boyutlar öğretmen kimliği altında indirgenerek hem de ayrı ayrı incelenerek bağımlı örneklem t-testi yapılmıştır. Öğretmen kimliği boyutunda yapılan bağımlı örneklem t testi sonuçlarına göre, müdahale öncesi ve sonrası puanları arasında anlamlı bir fark bulunmuştur (MD=-3,36, SS=7,55), $t(30)=-2,47$, $p<0,05$ (Şekil 14). Her bir boyut için ayrı ayrı yapılan bağımlı örneklem t-testi sonuçlarına göre, kendini sınıflandırma (MD=-0,22, SS=0,62, $t(30)=-1,96$, $p<0,05$) ve güven / öz-yeterlik boyutlarında (MD=-0,26, SS=0,81, $t(30)=-1,77$, $p<0,05$) müdahale öncesi ve sonrası puanları arasında istatistiksel açıdan anlamlı fark bulunmuştur. Ancak çocuklara ve öğretime

karşı doğal eğilim boyutunda fark saptanmamıştır (MD=-0,12, SS=0,54, t(30)=-1,22, p>0,05).

Öğretmen adaylarının öğretmenlik algılarını anlamak için yarı yapılandırılmış görüşmeler yapılmış ve tematik bir analiz yaklaşımı benimsenmiştir. İkinci soru için, veriler tümdengelimsel tematik bir analiz yoluyla analiz edilirken üçüncü soru için kodlama süreci boyunca kod ve temaların verilerden elde edildiği tümevarımsal tematik analiz benimsenmiştir.

İkinci araştırma sorusunun temaları pedagojik uzmanlık, didaktik uzmanlık ve konu alanı uzmanlığıdır. Tüm öğretmen adayları bu üç temel uzmanlığın hepsi için gelecekte iyi ve verimli öğretmenler olacaklarına inandıklarını ve bu uzmanlık alanlarında kendilerini yetkin hissettiklerini belirtmişlerdir. Ancak öğretmen adaylarına göre iyi bir öğretmen olabilmek için en önemli uzmanlık alanları pedagojik ve didaktik uzmanlıklardır.

Üçüncü sorunun temaları, öğretmen adaylarının, müdahalenin sağladığı olanaklara ve genel olarak müdahale hakkındaki geri bildirimlere ilişkin görüşleridir. Öğretmen adayları çoğunlukla müdahalenin onları eğitimle ilgili konularda düşünmeye teşvik ettiğini vurgulamışlardır. Ayrıca bazı ifadelerde bu düşünme sürecinin var olan inanç, düşünce ve bilgilerinin farkına varmalarını sağladığı da belirtilmiştir. Ayrıca müdahale eğitimle ilgili konularla ilgili var olan algılarını da değiştirmelerini sağladığından bahsetmişlerdir. Son olarak, öğretmen adayları yapılan müdahalenin, potansiyel matematik öğretmeni olarak kim olduklarını ve matematiğe yönelik mevcut duygularının ne olduğunu fark etmelerini sağladığını, matematik öğretmeni olma fikrini daha çok içselleştirmelerini sağladığını belirtmişlerdir.

Müdahale ile ilgili geribildirimlere bakıldığında, öğretmen adayları genellikle uygulama sürecinden ve müdahalenin amacından memnun kalmış ve bu süreci anlamlı olarak nitelendirmişlerdir. Ancak dönem boyunca sahip oldukları iş yükünden ötürü çalışmadan alabileceklerinden daha az verim aldıklarını da dile getirmişlerdir. Öğretmen adaylarından, hem esnek zaman çizelgesine göre yansıtıcı yazı yazmanın daha iyi olabileceğine hem de akranları ile aralarındaki iletişimin teşvik edilmesinin onlara daha fazla katkı sağlayabileceğine yönelik geri bildirimler gelmiştir.

4. Tartışma

Literatürde öğretmen adaylarının kimlik gelişimini teşvik etmek için yansıtıcı yazmanın kullanılmasını vurgulayan birçok çalışma bulunmaktadır (Conway, 2001; Durmaz ve Yiğitoğlu, 2017; Lutovac & Kaasila 2014; Kavanoz ve Yüksel, 2017; Korthagen, 2004; Küçükali, 2017; Milewski ve ark., 2018; Tütüniş ve Hacıfazlıoğlu, 2018; Urzua ve Vasquez, 2008; Walkington, 2005). Öğretmenlerle yapılan önceki çalışmalarda yansıtıcı yazmanın öğretmenlerin öz tanımlamalarını (Bengtsson, 2003; Van Manen, 1995), öz-yeterliklerini (Koc ve Yıldız, 2012) ve algıları üzerinde etkisi olduğu iddia edilmiştir. (Çelikdemir, 2018; Lerseth, 2013). Ayrıca, ileriye dönük yansıtıcı yazı yazma, yansıtıcı yazarların gelecekte karşılaşılabilecekleri olası olaylar bağlamında kendilerini eleştirmelerine izin verir (Van Mannen, 1995); bu nedenle kendi kendini sınıflandırma, öğretme inançları ve öğretmen kimliğinin farkında olma üzerinde olumlu etkileri vardır (Conway, 2001). Bu çalışmalar dikkate alınarak ilköğretim matematik öğretmen adaylarının mesleki kimlik gelişimini teşvik etmek için 10 haftalık yansıtıcı yazı yazma müdahale programı hazırlanmıştır. Bu müdahalede, öğretmen adayları Beijaard ve ark.'nın (2000) öğretmen kimliği çerçevesine dayalı konular hakkında haftalık yansıtıcı yazılar yayınlamışlardır. Öğretmen adayları ön ve son test olarak Erken Öğretmen Kimlik Ölçeği'ni cevaplamışlar ve yarı yapılandırılmış görüşmelere katılmışlardır. Testte öğretmen adaylarının kendini sınıflandırması, kendilerine güveni, çocuklara ve öğretime karşı doğal eğilimleri incelenmiştir. ETIM sonuçları bakımından araştırmanın bulguları, öğretmen eğitiminde yapılan yansıtıcı yazma uygulamalarının öğretmen kimliği gelişimi için olumlu faydalarını gösteren önceki araştırmalarla uyumludur (Brownlee, Dart, Boulton-lewis ve McCrindle, 1998; Campbell, 2005; ; de la Torre Cruz & Arias, 2007; Merseth ve diğerleri, 2008; Otteson, 2007).

Birinci ve üçüncü araştırma sorusu, öğretmen adaylarının müdahaleye ilişkin algılarını incelemektedir. Bakış açılarını derinlemesine anlamak için müdahaleye katılan yedi öğretmen adayı ile yarı yapılandırılmış bir görüşme yapılmıştır. İlk olarak öğretmen adaylarının kendilerini bir öğretmen olarak nasıl tanımladıkları ve iyi bir öğretmenin özelliklerinin neler olduğunu düşündükleri üzerinde durulmuştur. İyi öğretmen anlayışlarından elde edilen sonuçlar, ilgili alanyazında (Balban, 2015) iyi bir

öğretmen olmanın üç ana uzmanlığının önemini vurgulayan çalışmalarla paralel sonuçlar göstermiştir. Ayrıca öğretmen adaylarının, Balban'ın (2015) çalışmasının sonuçlarına benzer şekilde, konu uzmanlığı açısından kendilerini yetkin olarak algıladıkları belirlenmiştir. Bununla birlikte, öğretmenler mesleki kimliklerini de bu üç boyutun bir kombinasyonu olarak gördüklerini bildirmişlerdir (Beijaard, Verloop ve Vermunt, 2000) Bu durum, bu çalışmanın bulguları için de geçerlidir. Görüşme verilerinden kimliklerini bu boyutların bir kombinasyonu olarak gördükleri açıktır.

ETIM sonuçları ile nitel sonuçlar arasında benzerlikler elde edilmiştir. Nitel analizin ikinci ve üçüncü temasının sonuçlarında ve nicel analizin bulguları karşılıklı olarak birbirini desteklemektedir. Hizmet öncesi öğretmenlerin yansıtıcı yazmanın kimlik gelişimlerine olumlu etkilerinden memnun oldukları ve müdahalenin kimlik gelişimlerine sağladığı faydalardan bahsettikleri görülmüştür. Yansıtıcı yazılar, düşünmeyi ve farkındalığı kolaylaştırmak, yeni bakış açılarını teşvik etmek ve kimliği içselleştirmeyi kolaylaştırmak açısından öğretmen adaylarına yardımcı olmuştur. Müdahale öğretmen kimliğini daha fazla içselleştirmelerini sağlarken, kendilerini daha çok öğretmen olarak görmelerini sağlamıştır.

Ayrıca bulgular, öğretmen adaylarının müdahaleden sonra kendilerini daha yetkin hissetmeye başladıklarını göstermiştir. Yani müdahaleyle elde edilen algı değişikliği ve farkındalık, onları profesyonel benliklerine daha çok inandırmıştır. Bu sonucu ilk tema sonuçlarıyla karıştırdığımızda, müdahalenin pedagojik ve didaktik benliklerine daha çok etki ettiği sonucuna varılmaktadır. Nitel ve nicel sonuçların birleşiminde, öğretmen adaylarının ileriye dönük yansıtıcı yazılar sayesinde daha iyi bir öz değerlendirme ile kendilerini daha yeterli ve verimli hissettikleri görülmüştür. Bu sonuç, yansıtıcı yazmanın hizmet öncesi aşamada mesleki gelişim üzerindeki yararlı etkilerini gösteren önceki araştırmaların (Beltman ve ark., 2015; Lerseth, 2013; Urzúa ve Vásquez, 2008; Walkington, 2005) sonuçlarıyla paraleldir.

Çalışmanın sonuçlarına dayanarak, öğretmen adaylarının mesleki kimliklerinin gelişiminde öğretmen eğitimi programlarında yansıtıcı yazı etkinliklerine yer verilmesi önerilmektedir.

F. THESIS PERMISSION FORM / TEZ İZİN FORMU

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- Fen Bilimleri Enstitüsü** / Graduate School of Natural and Applied Sciences
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- Deniz Bilimleri Enstitüsü** / Graduate School of Marine Sciences

YAZARIN / AUTHOR

Soyadı / Surname : Ercan
Adı / Name : Amine Merve
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TEZİN ADI / TITLE OF THE THESIS (İngilizce / English): PRE-SERVICE MATH TEACHERS' PROFESSIONAL IDENTITY DEVELOPMENT THROUGH ONLINE ANTICIPATORY REFLECTIONS: AN INTERVENTION STUDY

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