



# How failure shapes teacher identities: Pre-service elementary school and mathematics teachers' narrated possible selves

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## HIGHLIGHTS

- Pre-service teachers' possible teacher selves shaped by the experiences of math failure are explored.
- Pre-service elementary and pre-service mathematics teachers' narratives are compared.
- Three categories of narrated possible teacher selves and differences within categories are identified.
- Possible selves of the two cohorts of pre-service teachers are more alike than anticipated.
- Failure experiences and possible selves need to be addressed in teacher education.

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## ABSTRACT

This study explored pre-service teachers' possible teacher selves with respect to how they have been shaped by their experiences of math failure. The study contributes to identity research by applying the theory of possible selves and by comparing and contrasting narrated possible teacher selves of pre-service elementary school teachers and pre-service mathematics teachers. Three categories of possible selves were identified: *teacher traits and actions*, *student strategies*, and *teacher self-development*. How possible teacher selves may inform teacher identity development and teacher preparation in the context of teaching mathematics is discussed, as are methodological considerations for examining narrated possible selves.

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## 1. Introduction

With respect to teaching mathematics and preparing teachers to teach the subject, existing research has placed great attention on identity (Graven & Heyd-Metzuyanim, 2019; Lutovac & Kaasila, 2018a; Darragh, 2016; Goldin et al., 2016). In order to better understand pre-service teachers' identity development, their experiences in the context of mathematics learning and teaching have been scrutinised (e.g., Black, Mendick, & Solomon, 2009; Brown & McNamara, 2011). Also, in the wider educational research, personal experiences and memories of school time have been found to play a central role in the process of becoming a teacher (Furlong, 2013; Miller & Shifflet, 2016; Ruohotie-Lyhty & Kaikkonen, 2009). However, pre-service teachers' 'failure' experiences and their resulting

personal understandings of what failure is have been scarcely explored (Lutovac, 2019), despite the fact that personal interpretations of experiences as failure can be emotionally distressing and can integrate into one's sense of self (Johnson et al., 2017; Dweck, 2006). Arguably, the experiences of math failure in the past, and even more so, the possible identifications with failure, may influence how pre-service teachers relate to teaching mathematics in the future, and the kind of future-oriented identities—possible selves (Markus & Nurius, 1986) with regard to mathematics teaching they develop (e.g., Lutovac & Kaasila, 2011, 2012, 2014). Furthermore, the relational nature of a teacher's work, with student-teacher relationships at its core (Uitto, Lutovac, Jokikokko, & Kaasila, 2018; Bauml, 2009; Shapiro, 2010), makes an examination of the meanings pre-service teachers attach to their failure experiences of utmost importance. These meanings may also shape how teachers understand student failure and how they interact with students, for example, the messages they convey to

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students with regard to failure and success (Dweck, 2006). In this process, student experiences of failure are also shaped, which, in turn, impacts their identities.

Addressing identity development in pre-service teacher education has generated a body of cross-study knowledge from the two cohorts who will teach mathematics in the future. In Finland and elsewhere, it is elementary teachers who are the first to teach mathematics to pupils of grades 1–6. These teachers are usually referred to as class teachers or generalists because they teach a variety of subjects. In secondary and upper secondary education, it is mathematics teachers who teach the subject. These teachers usually teach one or two school subjects and, therefore, have more expert knowledge. While both cohorts teach mathematics after they complete their studies, they do not have equal emphasis on mathematical content nor on pedagogical studies in their initial teacher education. This distinction in the background and education of both cohorts was also evidenced in various studies that have revealed the differing ways pre-service elementary school teachers and pre-service mathematics teachers think, feel and relate to mathematics, how they see their own mathematical abilities and how they learn to become mathematics teachers (Lutovac & Kaasila, 2018b; Beswick, 2006; Hodgen & Askew, 2007; Horn, Nolen, Ward, & Campbell, 2008; van Putten, Stols, & Howie, 2014). Suffice it to say, their identities as teachers of mathematics have been found to differ to a great extent, and their past failure experiences might be another element contributing to these differences. This line of subject-specific educational research, however, needs a less fragmented view of teacher identity development. Gaining a better understanding of the meaning that past failure holds for various pre-service teachers and the salient concerns of future teachers that arise from it (Hagger & Malmberg, 2011; see also; McGlynn-Stewart, 2010) must, therefore, be accomplished via a more comparative, single-study approach into the cohorts if teacher education settings want to support them adequately (Lutovac & Kaasila, 2018a; 2019).

With the premise, that the identity development is a future-oriented process (e.g., Dunkel, 2000; Urzúa & Vásquez, 2008), I apply the theory of possible selves (Markus & Nurius, 1986) to address the emergence of teacher identity in light of one's own experiences of math failure. Arguably, the possible selves framework can be particularly fruitful in the context of teacher preparation where pre-service teachers naturally seek self-definitions and are even purposefully encouraged to do so (Hagger & Malmberg, 2011; Le Cornu & Ewing, 2008; Conway, 2001). To date, however, only a few efforts have been made to apply the theory of possible selves for understanding pre-service teacher identity development, particularly in the context of teaching mathematics (Lutovac & Kaasila, 2014, 2012). With the aim of understanding how failure shapes future teachers, I first examined pre-service teachers' narrated *possible selves* shaped by their experiences of math failure. Second, I compared these possible selves with respect to two cohorts of pre-service teachers—elementary school teachers and mathematics teachers—in order to provide a less fragmented, single-study approach to investigate their identity development. This study was guided by the following research question: *What kind of possible teacher selves do pre-service elementary school and mathematics teachers narrate in response to reflection upon their experiences of math failure?*

## 2. Theoretical framework

### 2.1. Possible selves and identity

This work understands identity under a narrative definition,

which assumes that people make sense of their experiences in the narratives they tell, and in this process of sense-making, they actively construct and transform themselves (Bruner, 1990). Ricoeur (1991) defined identity as one's temporal understanding of oneself accomplished and integrated through narratives. Similarly, identity has commonly been defined as a narrative of who one once was, who one is now and who one would like to become (McAdams, 2017). With new experiences, new narratives emerge, which means that identities are continuously evolving. Narrative identities should, therefore, be understood as dynamic, temporal and integrative, reflecting not only one's inner world, but also implying the relational world (Smith & Sparkes, 2008). When operationalising pre-service teachers' narrated identities, especially in the context of teaching mathematics, the narratives they construct about teaching and learning mathematics can be understood as their mathematics-related teacher identities (Lutovac & Kaasila, 2018a). These narratives often contain various identity elements, such as experiences, beliefs, emotions and other constructs that can all be understood as the constituents of pre-service teachers' identities (Lutovac & Kaasila, 2011, 2014).

In this study, I focused on the future aspect of identity and how it is shaped by the past experiences. For this purpose, I applied the construct of possible selves, defined as images people hold about who they hope to become, expect to become or fear becoming (Markus & Nurius, 1986). Possible selves should, therefore, be viewed as a future-oriented aspect of identity. Akin to identity, possible selves are both stable and changing in response to time and context (Oyserman & Markus, 1990) and have also been understood in narrative terms (e.g., Packard & Conway, 2006; Whitty, 2002). Following the narrative definition of identity, possible selves can be operationalised as those narratives pre-service teachers tell about teaching and learning mathematics in a hypothetical future (Erikson, 2007).

In identity exploration and development, the construct of possible selves plays a crucial role. Possible selves are embedded in one's past and current experiences (e.g., successes and failures) and therefore, provide a framework for making sense of those experiences, as well as information about one's identity in the past and the present (Markus, 2006). Furthermore, Dunkel (2000) described the process of creating possible selves as facilitating one's identity development. Through generating possible selves, one has the opportunity to project, but also experiment with the various ideas about who they may become in the future (Lee & Oyserman, 2008). Some types of possible selves have been understood as positive—those that one strives towards such as 'hoped-for' and 'expected' selves, while others—those that individuals aim to avoid, such as 'feared' and 'avoidant' possible selves have been labelled as negative (Oyserman & James, 2015). On the other hand, Erikson (2007) argued that conceptualizing possible selves only in terms of becoming or fearing to become may result in a too narrow approach to the study of possible selves; instead, possible selves should be understood in terms of 'representing a great variety of different kinds of futures' (p. 351), including a certain degree of agency in the future.

The research has shed light on how one's possible selves can direct one's behaviour and actions by 'providing a roadmap connecting the present to the future' (Oyserman, Bybee, Terry, & Hart-Johnson, 2004, p. 132). An important contribution of possible selves pertains to facilitating one's motivation; when individuals see a gap between their current and future selves, motivation is enhanced (Oyserman & James, 2015). Additionally, the self-regulative function of possible selves has been discussed via numerous studies as a balance of hoped-for and feared possible selves (Oyserman & Markus, 1990). It is important that one constructs both, hoped-for selves, which serve as a goal, as well as feared possible selves,

which serve as a reminder of where one does not want to end up, therefore stimulating the effort invested. In addition, possible selves can impact one's wellbeing and optimism because 'they provide a sense that the current self is mutable' (Oyserman & James, 2015, p. 376). Finally, it has been shown that possible selves allow for self-improvement, change and growth (Lee & Oyserman, 2008), which is especially important in the context of becoming a teacher.

## 2.2. Possible selves in the literature on pre-service teachers' identity development

In educational research, the theory of possible selves has been employed to explore the process of teacher identity development (Hamman, Goselin, Romano and Bunuan, 2010; Hamman, Goselin, Romano, & Bunuan, 2010; Miller & Shifflet, 2016). Hamman et al. (2010) investigated the possible selves of pre-service teachers and novice in-service teachers. The authors identified four categories of possible selves pertaining to interpersonal relationships, classroom management, instruction and professionalism, as well as the differences between the pre- and in-service teachers. For example, their findings showed that pre-service teachers more often formulated possible selves that were task-focused, while in-service teachers formulated quality-focused possible selves. This finding was attributed to the in-service teachers' increase in practical experience. In another study, Hamman et al. (2013) investigated pre-service teachers' possible selves in their teaching practicums. They identified *expected* possible selves categories, such as 'professionalism' and 'learning to teach', and *feared* possible selves, such as 'uninspired instruction', 'loss of control' and 'uncaring teacher'. The authors further discussed the power of these findings to provide an explanation for issues such as teacher attrition and retention.

Dalioglu and Adiguzel (2016) examined the change in pre-service teachers' self-efficacy beliefs and possible selves as a response to the final teaching practice during their teacher preparation. While the authors identified the changes in self-efficacy beliefs as a response to teaching practicum, participants' *expected* possible selves did not change much. On the other hand, pre-service teachers' *feared* possible selves did change. In all, these studies have also underlined the integrative power of possible selves—helping bring together and understand various concepts and their relations, for example, identity and agency (Hamman et al., 2010). However, there is still much to understand about how the construct of possible selves shapes and helps us explain the process of becoming a teacher, especially in subject specific contexts.

In the context of science teaching, Hong and Greene (2011) addressed pre-service teachers' hopes and fears for their future teaching. The authors identified six categories: 'sufficient/insufficient content knowledge', 'well-managed/poorly-managed classroom', 'effective/ineffective teaching', 'being caring and helpful/not being caring and helpful', 'having positive/negative attitudes toward students and teaching', and 'demonstrating leadership/not being liked or respected by fellow teachers'. The authors also recognised the impact of past experience on the formation of these possible selves, which appeared to be greater than the impact of teacher education (see also Ruohotie-Lyhty & Kaikkonen, 2009).

In the mathematics education context, however, the framework of possible selves has been applied scarcely (Lutovac & Kaasila, 2014), and we have insufficient knowledge even in terms of what kind of possible selves pre-service teachers hold with respect to

mathematics teaching. Lutovac and Kaasila (2014) have addressed the balance of possible selves—the presence of hoped-for and feared selves in the same domain (Oyserman & Markus, 1990)—as a necessary factor in understanding the mathematical identity work that pre-service teachers engage in during teacher training. The authors suggested that imbalance in hoped-for and feared selves may render future teachers 'irresolute' in terms of how they see themselves as teachers of mathematics in future. Alternatively, better balance between the possible selves can lead to 'decisiveness'—future teachers' awareness of their personal goals and knowing how they will achieve them. In all, the explanatory potential that possible selves have helps researchers and teacher educators to better understand pre-service teachers' identity development, i.e. how their identities may have been formed and predict their future thinking and action.

## 3. Method

I positioned the self as a story (Bruner, 1990; Ricoeur, 1991), which led to employing narrative methodology to the study of pre-service teachers' failure and possible selves (e.g., Packard & Conway, 2006). Narrative methodology has been found beneficial in the study of possible selves as written narratives tend to generate a greater number of possible selves than other methods, such as questionnaires and structured interviews (Whitty, 2002). The collected pre-service teachers' writings here were understood as narratives, and their possible selves were also operationalised and analysed in terms of a narrative. I followed the principles of narrative research as outlined by Lieblich, Tuval-Mashiach, and Zilber (1998), as their holistic and categorical approaches allow for examining the individual narratives, as well as the comparison of narratives produced by several individuals and groups. In order to analyse possible selves in the narratives of two cohorts of pre-service teachers, I applied categorical analysis of the content that these narratives carry.

### 3.1. Participants and data collection

This study was conducted in a Finnish university context in the teacher education department as a part of the project on pre-service teachers' 'Narrated failures' (Academy of Finland, Project ID 307672). Two sets of data were used. Data Set 1 was collected in the context of subject teacher education in a didactics course for pre-service subject teachers of various disciplines, such as math, history, language, etc. The pre-service teachers who participated in the course were in their third year of study and had just began their 60 ECTS credit pedagogical studies in the teacher education department. Previously, they attended the courses in their own respective departments. The course was organised as a series of lectures on different topics provided by various lecturers in the department. Following a lecture on teacher identity, students were instructed to write about their experiences of failure, and the way those experiences shaped their teacher identity. These writings were used as data. The author of this paper constructed the instructions for the writings jointly with the course lecturer, and students were prompted with questions such as: *Tell about your experiences of failure (in your main subject) and how these have shaped you as a future teacher? As the aim of the study was to look at failure in the context of mathematics, I focused only on the data obtained from pre-service teachers who are studying to become math and science teachers, teaching two of the following subjects, that is, mathematics and/or physics and chemistry, predominantly*

in secondary and upper-secondary schools. Twenty-two math and science pre-service teachers participated in this study. Four writings did not address the question; therefore, the remaining 18 narratives were analysed. From these, the data excerpts responding to the failure in relation to future teaching were extracted to create a data set. This included the responses to, for example, the question: *As a future teacher, how do I understand my students' failure in my subject, and how does this affect my teacher identity?*

Data Set 2 was collected in an elementary school teacher education context in a mathematics didactics course for pre-service elementary school teachers in their first year of 300 ECTS credit studies. Pre-service elementary teachers are those studying to become elementary teachers, teaching children ages 7–12. The course also accommodated exchange students and students in the international teacher education programme. Participants were asked to write an essay on the topic of 'math failure and identity' as one of the optional tasks that would give them additional points contributing to their final grade. The author of this paper constructed the instructions for the writings and gave a talk about the study in one of the course sessions. Essay prompts included, for example: *Choose 1–3 meaningful episodes from your past in relation to mathematics (from primary school until today) that you labelled as failures. How did the chosen experiences of math failure shape you?* However, students could also write freely as long as they reported on their experiences of failure. Forty-five pre-service teachers' writings were obtained. After careful reading, data was extracted from 43 writings to obtain a data set produced in response to the question: *In what way may experiences of math failure shape your teaching and you as a teacher in future?* In two pre-service teachers' narratives, this matter was not explicitly addressed.

The purpose of assigning the writing tasks was two-fold. First, in both courses, the students engage in discussions about the meaning of their own past experiences and the intentional reflection upon those experiences in the process of becoming a teacher. Therefore, these tasks fulfilled the pedagogical purpose of enabling students to reflect upon specific experiences in relation to their development as teachers. In both courses, students also discussed those experiences in class. Moreover, in many of the writings, students highlighted how meaningful the task was for them and the importance of their reflection upon failure; many of them said they would provide such opportunities to their own students once they become teachers.

Second, within the teacher education studies of the two cohorts, the importance of research-based teaching is emphasised, which means that teacher educators collect data within their courses and may use student work for research purposes. Therefore, the students become familiar with these practices in various courses. That said, students are informed in detail whenever the work produced within any given course may be used as research material. They are also asked for written consent. While usually all students complete such tasks as those assigned in this study, they do not have to consent to their data being used for research purposes. The students are also informed and are thus aware that their consent decision does not affect their completion of the individual course or their studies. The same was the case with participants in this study; they were fully informed about the study and the use of their work for the purpose of research and consent was obtained from all the participants. The students were also provided with the contact details of the researcher (the author of this study) should they have any further questions about the study or the data analysis.

### 3.2. Analysis of narratives

I employed categorical analysis of narratives as the analytical technique (Lieblich et al., 1998). This means that the collected narratives were analysed in terms of their content and emerging categories one-by-one and in terms of common categories cutting across the data sets in order to enable comparison between the data sets (and/or participants). The first step in analysis, however, involved a holistic reading of all the writings (Lieblich et al., 1998). This reading aimed at identifying all the data extracts containing pre-service teachers' reflections on future teaching entwined with their views about failure and resulted in the creation of two subsets of data containing all the relevant extracts to be analysed further. The second step was the actual analysis of narratives, which began with a careful reading of all the extracts in terms of their content. No predetermined codes were used; therefore, this reading yielded the formation of the codes. The process of assigning codes, however, was guided by the search of various types of possible selves in the data. Based on the codes assigned to each extract, common themes and categories cutting across both data sets began to emerge. This resulted in five categories found in Data Set 1 and seven in Data Set 2. There was an overlap between some of the categories in terms of content and some categories subsumed others. This led to a reduction of categories found in each data set to three, wherein one of the categories consisted of two sub-categories: (1) possible selves focused on 'teacher traits and actions', (1a) sensitivity towards students and their failures, (1b) using different instructional strategies, (2) possible selves focused on 'student strategies' and (3) possible selves focused on 'teacher self-development'. The same three categories were found in both data sets; however, the differences identified within these categories between the two cohorts of pre-service teachers were addressed. It is important to note here that analysing possible selves in narrative terms meant that one data extract could contain possible selves pertaining to only one category or all three.

## 4. Findings

In this section, I present the content of the three categories of possible selves identified in the narratives of both pre-service elementary school teachers and pre-service mathematics teachers. The appendix gives an overview of the categories and their descriptors. This section entwines brief extracts and short narratives; this not only gives readers insight into the variety of voices and the content of their possible selves, but also into the shape that these possible selves took in narratives. In the case of short narratives, a variety of possible selves pertaining to more than one or even all of the above-mentioned categories may be observed. Possible selves were identified via various cues, which are underlined in the extracts in order to enable further discussion of this matter. The data excerpts from both cohorts of teachers are presented using a label PsET for pre-service elementary school teachers and PsMT for pre-service mathematics teachers.

### 4.1. Possible selves focused on 'teacher traits and actions'

Possible teacher selves focused on 'teacher traits and actions' were clearly the most common of the three categories found in all pre-service teachers' narratives. Pre-service teachers expressed their possible selves in the form of specific future teacher traits and actions that will either ameliorate their students' possible experiences of failure or help them manage these. Within this category,

**Table 1**

Data excerpts describing pre-service teachers' possible selves focused on 'sensitivity regarding students and their failure'.

Pre-service elementary school teachers	Pre-service mathematics teachers
<u>I would also like to</u> avoid labelling students by saying that they clearly do not have a natural inclination towards mathematics, because such a statement may prevent a student from even trying his or her best and fall short. (PsET 6)	As a teacher, <u>I will surely</u> notice the failures of my students, and <u>I understand</u> that everyone makes mistakes and fails. My job is to help the student learn about failure. In addition, <u>as a teacher, it is important</u> to make it clear to students that failures happen to everyone. The key to failures is accepting them and thinking about how to avoid them in the future. As a teacher, <u>I will certainly</u> find myself in situations where a student's motivation decreases with failure. In this case, I have to help them regain motivation by trying out different teaching styles or assignments where the student can have successful experiences. <u>I know that</u> if you do not experience success in your subject, it will greatly influence your learning motivation. (PsMT 6)
<u>I would like</u> to be able to give students enough challenges in class, but also to take into consideration students who are struggling. Perhaps if in my own advanced math studies teachers had noticed, intervened and supported and encouraged me to try more, I might have found joy in advanced mathematics. (PsET 30)	<u>I wish I could be</u> a teacher who is able to spot the students' difficulties and provide support. (PsMT 10)
<u>I hope</u> my experience reminds me as a teacher of how to answer children's questions. <u>I want</u> every child to feel their questions are justified and not feel inferior because of it. <u>I believe and hope</u> that as a teacher I can also take into consideration children who do not understand the assignments, because I myself did not always understand everything at once. Math has never been too easy for me, so I can position myself as a child. You could say that as a teacher, I want to turn my weaknesses into strengths and to use my experience to better understand children who may have learning difficulties. (PsET 42)	<u>I still cannot</u> say with certainty how I would understand the failures of my own students in my subject. I think I could identify with the failures of many students because I still remember mine. It can be harder to understand the repeated failures of the weakest in my subject. It can help that I have also had one subject that I could not do at all. I had English. However, math and English are quite different. (PsMT 14)
<u>I also know</u> that every child can achieve their goals if they have a good teacher and enough support and motivation. (PsET 4)	<u>It is also important</u> to seriously emphasise to students that you do not compare them to other students, because each of us is our own individual who learns and knows differently. (PsMT 16)
Personally, <u>I want to</u> encourage students more, especially when they experience failures. <u>I think it is important</u> that a student is never told that he/she has a poor grade, but is reminded that we all fail sometimes, and individual failures do not determine competence. (PsET 26)	

**Table 2**

Data excerpts describing pre-service teachers' possible selves focused on 'general teacher traits'.

Pre-service elementary school teachers	Pre-service mathematics teachers
Based on my own experience, <u>I want to be</u> the most inspiring and stimulating teacher. (PsET 11)	...inspiration is one of the most important qualities of a teacher, so <u>it should be given</u> special attention in teaching. For example, a variety in lessons can influence students' enthusiasm. (PsMT 20)
As a teacher, <u>I will</u> motivate my students for new and better results. <u>I will definitely</u> use my own ideology, so the bad results will not lead you to worry, but you will have to continue to be stronger and more determined towards the next challenges. (PsET 34)	<u>I think the teacher should be</u> encouraging and motivating, not discouraging like in the previous examples. (PsMT 21)
<u>I want to be</u> a teacher who is mindful, encouraging and motivating ... (PsET 45)	

'sensitivity regarding students and their failure' was a common possible teacher trait discussed alongside of some more general teacher traits. Moreover, pre-service teachers' possible selves were also focused to a great extent on 'using different instructional strategies'.

In all pre-service teachers' narrated possible selves, the focus on teacher traits, such as 'sensitivity regarding students and their failure' (see Table 1) was strongly present. Pre-service elementary school teachers on one hand spoke about noticing and supporting, specifically, those students who struggle, and on the other hand, about taking into account all students and/or making sure all students learn, as well as being able to understand different students. Their experiences of past failure also resulted in projecting possible teacher selves that avoid labelling and categorising, and teachers who think before saying something that may have a negative impact on the students' experience of learning mathematics. Pre-service mathematics teachers' possible selves also revolved around noticing students' failures/difficulties, taking into account all students (including stronger ones) and trying to understand different students including their differing perceptions of failure. A possible teacher self that involves avoidance of comparing students was also identified in one pre-service mathematics teacher's narrative.

Both, pre-service elementary school and mathematics teachers

narrated possible selves included also more general teacher traits (see Table 2), such as being supportive, encouraging, inspiring and mindful, as well as motivating with regard to students' failures.

Both cohorts of pre-service teachers narrated possible selves focused on teacher actions, such as 'using different instructional strategies' (see Table 3). Many examples of pre-service elementary school teachers' possible selves involved references to supporting individual students and the use of differentiation and teaching for understanding of all students. They also strive for fair assessment and the use of varied, interactive teaching methods. Some highlighted the use of concrete examples in order to support student learning. In several narratives, teaching in a manner that would provide students with successful experiences was at the forefront. One way of operationalising these possible selves was by providing instruction that would be fun and interesting, as well as finding alternative strategies to support students' learning difficulties. Based on experiencing mathematics learning and instruction as a competitive process, some possible teacher selves involved creating competition-free classroom. Pre-service mathematics teachers' possible selves with regard to instructional strategies were less varied; however, they similarly involved the references to fair assessment, the use of varied and interactive teaching methods and the use of feedback in order to increase students' motivation.

**Table 3**  
Data excerpts describing pre-service teachers' possible selves focused on 'using different instructional strategies'.

Pre-service elementary school teachers	Pre-service mathematics teachers
<p>... <u>one should</u> never create a picture of a student based on one exam or course. <u>I also believe</u> that the use of good and varied teaching methods in teaching is important and in general, to create a positive image of the subject, even if there are difficulties. (PsET 16)</p> <p><u>Maybe</u> my experiences of failing and succeeding will help me teach in a more interactive and diverse way. <u>I hope that</u> I can come up with solutions that will provide as much feeling of success as possible. (PsET 18)</p> <p>Using every day, concrete situations in teaching is <u>generally a good way</u> to make lessons more meaningful. (PsET 33)</p> <p>Before the exams, <u>I will</u> repeat things well and give [students] some easy basic tasks for the exam, so that everyone would know something. (PsET 37)</p> <p><u>I will</u> do the same as my own teachers so that more advanced students can be involved in teaching others. <u>I hope that</u> as a future teacher I can see if the student really understands this. I would nod and say I understood, even though I didn't really understand. <u>I hope</u> my future students won't use this same tool as it doesn't serve them much. (PsET 44)</p> <p><u>I would like to avoid</u> creating a competitive atmosphere in my class by maintaining a good atmosphere and a sense of peace. (PsET 7)</p>	<p><u>I will strive to act</u> like my junior high school teacher, but still want to be myself, find my strengths and learn how to use them. (PsMT 5)</p> <p>Students should not be 'condemned' for failure. The overall picture is much more meaningful. <u>I can highlight</u> this in my teaching in assessment. (PsMT 11)</p> <p><u>As a future teacher, I want to be able to</u> take every student into account when choosing my teaching methods. (PsMT 17)</p> <p><u>I would try</u> to give my students feedback on what was good and then try to motivate them to do well, as long as they can work hard enough and learn from their failures. (PsMT 16)</p>

**Table 4**  
Data excerpts describing pre-service teachers' possible selves focused on 'student strategies'.

Pre-service elementary school teachers	Pre-service mathematics teachers
<p><u>I want to become</u> a teacher who gives all students a chance to learn and get motivated. <u>I want to be</u> open about the importance of knowledge and teach students to care and never give up. (PsET 2)</p> <p>... <u>I want to teach</u> my future students that no matter their background with a certain subject, they need to persevere and work hard because even though it may not be their preference, it will be useful for their whole life. (PsET 19)</p> <p><u>I will try to</u> encourage my students to find the golden mean. By this I mean learning a neat enough handwriting and learning how to let go of excess perfectionism. (PsET 15)</p> <p><u>I want to</u> emphasise to students that failure in mathematics is natural. <u>I will</u> tell about my own experiences and that teachers also make mistakes. I don't want to increase competition in my class, but instead, I want to support doing things together and helping each other. I do not support multiplication tests every morning, which certainly show who doesn't [do well]. Nor do <u>I want to</u> put on the stand those who do well, though of course, <u>I will</u> praise and encourage them. I'm going to make studying math fun and somehow carefree. No one should be afraid of failure or ashamed of their own skills. (PsET 20)</p> <p><u>I wish</u> that I can help them gain the necessary resistance to push through even though they might struggle and to prevent them from losing their self-confidence when they feel they are failing. (PsET 21)</p>	<p>First, through my own experiences of success, <u>I understand</u> how important teacher feedback can be to the learner. My teachers saw my strengths and encouraged me to develop them. The teacher's role was great in the fact that I found myself studying what I am studying now. As a teacher, <u>I want to</u> do my best to help the learner find things where they excel and tell them aloud. I've heard that some guidance counsellors in high school advise learners not to select advanced math courses because they do not stand up to it. <u>I will</u> try to tell the learner exactly what he or she is good at. If the mathematically weaker learner wants to take advanced math course, <u>I have to</u> support him and help him as best as I can. <u>The learner must</u> feel that his or her strength is realised, and he or she can gain confidence and succeed wherever he or she is. (PsMT 2)</p> <p><u>I'm going to</u> be a teacher of failures. <u>I will not</u> punish students for failure, but <u>I will</u> encourage them to learn from it. (PsMT 3)</p> <p><u>I will</u> encourage students to move forward when difficulties come and try to get them to learn to self-evaluate and also to accept their own shortcomings. (PsMT 7)</p> <p>As a future teacher at this point, <u>I feel that</u> it is perfectly desirable and permissible to fail in mathematics. It is part of the study of mathematics and it is part of every student. (PsMT 13)</p>

**Table 5**  
Data excerpts describing pre-service teachers' possible selves focused on 'teacher self-development'.

Pre-service elementary school teachers	Pre-service mathematics teachers
<p>As a future teacher, <u>I want to</u> strengthen my knowledge of mathematics, but also to gain more confidence. <u>I also want to</u> learn to teach the topic in a way that is meaningful to students. (PsET 6)</p> <p><u>I would like to</u> study mathematics as a minor subject so that I would be better equipped to teach it in lower grades or possibly even in higher grades of primary school. (PsET 10)</p> <p><u>I would also like to</u> teach myself to be merciful with myself, and that the result is not the result of all knowledge, but that the whole process of learning is more important than the results. (PsET 24)</p> <p>... For example, not all students had sufficient study skills to independently review assignments. <u>This should</u> affect me as a future math teacher so that <u>I need</u> more experience and confidence to teach it. (PsET 36)</p>	<p>Even though mathematics has always been easiest for me, I know that's not the deal with everybody. However, this is difficult for me to understand. At this moment, the above-mentioned is my biggest flaw as I'm thinking my future career as a teacher. <u>I know</u> that the subjects I will teach, math, physics and chemistry, are very challenging for some of the students, but <u>I cannot</u> understand why. I have also performed well in traditional exam situations, and even though <u>I know</u> that for some people it causes a huge amount of stress, 'freezing' and underachieving, I simply just don't understand where it comes from. I don't feel I'm a cold person, but <u>I might</u> unintentionally demand too much from people. This is the side of myself <u>I would like</u> to develop, and as is it, I am constantly working on it. (PsMT 22)</p>

#### 4.2. Possible selves focused on 'student strategies'

As opposed to the teacher perspective, these possible selves take a student perspective, focusing on student-development and the strategies or skills students would need in order to be able to face failure. These possible selves included the idea of teaching/telling students specific strategies to handle failure or expecting that students should view failure in a specific manner (see Table 4).

Pre-service elementary school teachers' possible selves focused on strategies for teaching their students to care, persevere, work hard and practice while letting go of their perfectionism. Possible teacher selves also highlighted helping their students know what failure is, understand that everyone fails, maintain their confidence in the face of failure and teach them to focus on future studies, that is, keeping in mind that failure is part of life and deciding what matters and what does not. Pre-service mathematics teachers, similarly, projected possible teacher selves focused on helping students know their strengths, learn from failure, self-assess, accept failure and their own weaknesses, and make it clear to students that failure is permissible.

#### 4.3. Possible selves focused on 'teacher self-development'

Only a few data excerpts pertained to the possible teacher selves focused on 'teacher self-development' (see Table 5). Four pre-service elementary school teachers' possible selves highlighted the need to have stronger math knowledge, better confidence and better pedagogical content knowledge for future teaching. They also mentioned learning to be kinder with oneself and needing more experience. Only one pre-service mathematics teacher narrated the need to develop her knowledge with regard to her students' needs. She recognised as her weakness the inability to understand students who struggle with math, particularly due to overall success she herself has experienced in the context of mathematics learning (see Lutovac, 2019, Tiina's short story).

### 5. Discussion

This paper presented a, thus far, rare investigation of both pre-service elementary school and pre-service mathematics teachers' possible teacher selves in the context of math failure. Three main categories of possible selves were identified. First, possible teacher selves focused on 'teacher traits and actions' that pertain to what pre-service teachers report themselves to be and/or to do in order to take math failure into account in their future teaching. Second, possible teacher selves focused on 'student strategies' that pertain to the strategies pre-service teachers report their students need with respect to math failure. And finally, possible teacher selves focused on 'teacher self-development' as it pertains to what pre-service teachers report they need to develop in order to take math failure into account in their future teaching. These categories of possible selves revealed that failure experiences played a significant role in the process of becoming a teacher. They revealed that failure shapes the traits pre-service teachers' desire to have or to avoid having as teachers and the ways they think about their future instruction, teaching methods and assessment. In addition, failure also shapes their thinking about students' needs and about the student-teacher relationships and interactions. Finally, failure experiences have shaped how some pre-service teachers think about their own strengths and weaknesses as future teachers, and hence, what areas need development. While the kind of math failure the two cohorts experienced may have been different, the categories identified in this study revealed surprisingly similar possible teacher selves. Within those categories, however, some subtle differences were identified and will be discussed in what

follows. I will highlight some observations regarding the content and form of possible teacher selves as well as some methodological considerations for the studies on narrated possible selves.

#### 5.1. 'Avoidant' possible teacher selves were more common in pre-service elementary teachers' narratives

In the category of 'teacher traits and actions', pre-service elementary school teachers' possible selves often included being different or teaching differently than their own teachers in the past. The reason for this likely lies in what research has thus far demonstrated; they often report to have had negative experiences regarding mathematics learning and teaching (e.g., Bekdemir, 2010; Black et al., 2009; Hodgen & Askew, 2007) and would therefore want to avoid such practices in their future (Di Martino & Sabena, 2011; Gellert, 2000). For example, they want to avoid labelling or negatively defining who students are, avoid students' anxiety and fear of failure. These kinds of possible selves were unlikely in pre-service mathematics teachers' narratives. While these 'avoidant' possible selves can act as incentives for future action, it is crucial that these are not the only type of possible selves projected. For the development to occur, negative possible selves—those pre-service teachers want to avoid becoming or fear becoming must be paired with positive selves—those they expect, believe or hope to become (Oyserman & James, 2015; Oyserman & Markus, 1990). This has been known as balance of possible selves. While I have elsewhere reported on imbalances in pre-service elementary school teachers' possible selves (Lutovac & Kaasila, 2014), in this study, this was not the case. In terms of pre-service teachers in question and their identities, it appears that they know who they do not want become, but also know who they want to become (Lutovac & Kaasila, 2011, 2012, 2014).

#### 5.2. Pre-service elementary school teachers expect, while pre-service mathematics teachers hope to be able to notice student difficulties

In the subcategory, 'sensitivity regarding students and their failure', pre-service mathematics teachers' possible selves revolved around noticing student difficulties, particularly around a concern about whether one would be able to notice these difficulties. This has been brought up by them feeling they have not experienced sufficient failure to be able to understand weaker students and what they are going through when faced with difficulties. On the other hand, pre-service elementary school teachers' possible selves reflected almost taken-for-granted knowledge of student struggles. While pre-service mathematics teachers *questioned* whether they will be able or *wish* they will be able to spot, understand and help their students, pre-service elementary school teachers *know* with certainty they can understand their students. Arguably, both matters are important from the perspective of the power possible selves have on one's motivation and future action (e.g., Oyserman & James, 2015). For example, this finding may suggest that pre-service teachers' motivation to work towards these particular possible selves may be impaired in the long run. Too much uncertainty can make pre-service teachers feel that regardless of the effort invested, they will not reach their goals. This can easily lead to indecisiveness and even disengagement (see e.g., Lutovac & Kaasila, 2014). Being too certain, on the other hand, can make pre-service teachers feel that their goal will be reached, even if they do not take any action towards it. This can lead to an unwillingness to invest effort and develop further. For example, if pre-service mathematics teachers remain uncertain about being able to notice their students' failure and provide help, they may, in the long run, simply choose not do anything about it. On the other hand,

because pre-service elementary teachers are confident with regard to the same matter, they may not go further from their own experience, and may not do anything to develop new strategies for how to help their students with respect to failure. Therefore, both, arising future-oriented concerns as well as confidence need to be brought to pre-service teachers' attention and require further discussion if we are to help pre-service teachers find strategies to deal with these matters and continue developing as professionals.

### 5.3. Only a few pre-service teachers narrated self-development focused possible teacher selves

Additionally, there was an interesting observation in relatively limited possible selves pertaining to the category of 'teacher self-development'. A few pre-service elementary teachers narrated the ways in which they would like to develop themselves in order to become better teachers of mathematics. However, the category appeared in only one pre-service mathematics teacher's narrative. In fact, in some narratives, pre-service mathematics teachers reported (with confidence) that they have sufficient knowledge and skills to teach math in the primary, secondary and upper-secondary levels. Also, in one narrative, a pre-service elementary school teacher said, 'Failure does not affect me as a teacher'. Provided that pre-service mathematics teachers study mathematics on a more advanced level than the level they will teach in the future, they may indeed have sufficient knowledge and skills. From the perspective of possible selves theory, this can also be interpreted as them not seeing much of a difference between their current selves and their possible selves. We know, however, that a gap between the present and the future self is necessary for one's motivation to work towards the desired future selves (Oyserman & James, 2015; see also; Lutovac & Kaasila, 2014). This is also well in line with the research that addressed balance of possible selves (e.g., Oyserman & Markus, 1990) and what we can learn from it is that in order for these pre-service teachers to hold possible selves pertaining to the category of 'teacher self-development', they need to be cued with selves that are discrepant enough from the current ones they hold. That is, if they hold currently mostly positive selves, these could be balanced out with negative ones. Moreover, Oyserman et al. (2004) discussed that possible selves may sometimes be disconnected from the strategies regarding how to achieve those selves; the strategies, however, are crucial if one is to attain the desired state (see also Lee & Oyserman, 2008). 'Teacher self-development' possible selves category could in itself be interpreted as the strategy to achieve other possible teacher selves. In this sense, the finding about the overall scarcity of possible selves pertaining to this category may also signal that pre-service teachers lack action plans for achieving other desired possible selves, such as those pertaining to the other two categories in question.

### 5.4. The absence of feared selves in narrated possible selves

In this study, I analysed *narrated* possible teacher selves. Unlike those measured in various surveys, these possible teacher selves did not emerge in response to specific questions, rather, they emerged in pre-service teachers' essays on 'failure in mathematics' and the ways this failure has shaped them as students and will shape them as future teachers. The students were encouraged to reflect upon their future as teachers and in relation to their students' failures, but without any pre-determined questions about their possible teacher selves. One consequence of such a methodological decision could be observed in the absence of feared

possible selves in the entire data set, which have otherwise been commonly found (e.g., Hamman et al., 2010; Miller & Shifflet, 2016; Ronfeldt & Grossman, 2008). While some pre-service elementary teachers narrated those possible selves they would want to avoid, the utterances such as 'I am afraid of ...' could not be found in any of the pre-service teachers' narratives. This finding could signal that the pre-service teachers in question, surprisingly, do not have particular fears with regard to their future in the specific context of this study (e.g., McGlynn-Stewart, 2010). On the other hand, some concerns addressed earlier could be interpreted as subtle fears. However, as pre-service teachers were allowed to use their preferred ways of expression in their narratives, possible selves in the form of fears were not evoked. Also, asking students to write narratives guided by open prompts may have opened up an opportunity for them to tell about the matters that are relevant to them and their experiences, rather than forcing them to form possible selves in the form of expected, hoped-for, feared and/or avoidant selves. Moreover, this finding also highlights the need for researchers to interpret narrated possible selves and develop more nuanced ways of reading and interpreting the data.

### 5.5. Narrated possible selves take various forms

Another consequence of examining possible selves in terms of narratives is that these possible selves did not always take the typical form commonly found in the literature, such as 'I want to become ...' or 'I am afraid of becoming'; rather, they manifested in a variety of different forms of future-oriented talk (e.g., Urzúa & Vásquez, 2008), such as 'I will ...', 'I want to .../I definitely want to ...', 'I believe and hope that ...', 'I still cannot...'. Some possible selves were also expressed in a rather general or impersonal ways, such as 'as a future teacher, it is important ...' and 'I think the teacher should ...'. Moreover, other possible selves were also implicit, and had to be inferred from pre-service teachers' narratives. These findings point out that the variety of forms of possible selves found here bring forth the need to acknowledge that possible selves may not always manifest as 'I' sentences, but may as well include more general utterances within one's reflection upon their experience, such as 'it is important for teachers...' or 'teachers should'. In addition, these findings also signal different degrees of pre-service teachers' certainty about the attainability of their possible selves. For example, the utterance starting with 'I will' suggests a higher degree of certainty than the utterance 'I hope'. Methodologically, these findings highlight the opportunity for researchers to analyse various future-oriented data in terms of possible selves.

### 5.6. Math failure and its relevance for possible teacher selves

The starting point of this study was to better understand how math failure shapes future teachers. The possible selves framework, especially looking at the narrated possible selves, provided a means to get closer to answering this question as it allowed for the investigation of meaning making (e.g., Erikson, 2007; Markus, 2006). Pre-service teachers' possible selves, greatly bound to their past experiences as students (Miller & Shifflet, 2016; Lutovac & Kaasila 2012, 2014), displayed how pre-service teachers make sense of their past math failure or lack thereof. Even if nothing would be known about the lived 'failure' experiences of these pre-service teachers, their possible selves reveal some instances of the kind of experiences these were. These possible selves are more than mere wishes and fears for the future; they also revealed pre-service teachers' subjective understandings of failure, that is, how they



have come to understand their own experiences of failure. I have elsewhere discussed personal understandings and the subjectivity of failure (Lutovac, 2019); however, here possible selves provided an insight into how these personal meanings of failure were created upon the reflection on the past, experienced failure, which may, in turn, further signal how these pre-service teachers aim to approach their students' failure in their future teaching as well as how they can assist their struggling students with their teaching.

This brings forth the discussion on relationality in teachers' work, particularly as it pertains to teacher-student relationships. Most possible selves projected by the pre-service teachers in this study can be characterised as relational—they were shaped with future students and student-teacher relationships in mind. For example, these relational qualities were evident in possible selves focused on *student strategies*, where pre-service teachers used their own past failure experiences as a source of knowledge about their future students and about the knowledge, skills and needs they may require to handle student failures. Even more, possible selves pertaining to the subcategory of 'sensitivity regarding students and their failure' clearly carry an aspect of caring, which is at the core of the relationships teachers have with students and their interactions with them (Uitto et al., 2018; Shapiro, 2010). Moreover, pre-service elementary school teachers have often been thought of as paying too much attention to the relational characteristics of teaching at the expense of the instructional ones (Gellert, 2000), while pre-service mathematics teachers have been perceived of as the opposite (Ng & Anderson, 2011). In this study, however, both cohorts' possible selves reflected the relational characteristics of the teacher's work. Additionally, both cohorts' possible selves focused simultaneously on relational and instructional dimensions of teaching, and most importantly, their entwinement (Bauml, 2009). This further suggests that all pre-service teachers in question see the phenomenon of math failure calling for an approach that involves a certain kind of teacher-student relationship and a certain kind of instructional strategy, and that both may contribute to their students' academic success. Provided that both cohorts of pre-service teachers in this study only recently began their development as teachers, their possible selves with regards to handling math failure may be 'indicative of a more sophisticated view of teaching than pre-service teachers are typically afforded in the literature' (Bauml, 2009, p. 906).

### 5.7. Implications for teacher education

This study has several implications for teacher education. First, the findings demonstrate the need to discuss failure experiences in the context of teacher education. Failure as a highly emotional and relational phenomenon seems to be particularly suitable for stimulating nuanced reflection upon the various dimensions of the teacher's work. Discussing failure via creation of possible teacher selves will push pre-service teachers to think about their future students, as well as the entwinement of the relational and instructional aspects (e.g., Bauml, 2009) through examining their own past experiences. The opportunities to discuss failure experiences and possible selves will also help teacher educators notice the possible imbalances between positive (e.g., hoped-for, expected) and negative (e.g., feared, avoidant) possible selves and help pre-service teachers become aware of these imbalances (Lutovac & Kaasila, 2014). In this process, pre-service teachers can be assisted in projecting the type of possible self that is missing in their narratives of becoming a teacher. Projecting possible selves can help teacher educators address the potential lack of pre-service teachers' future-oriented teaching confidence or alternatively, too

much of it. The finding that feared possible selves were not identified in this study, brings forth the importance of creating a setting where pre-service teachers can express fears and future-oriented concerns openly, knowing that these too are drivers of their development. Knowing how to act upon those, and also knowing that they indeed have the power to act upon them, will instil pre-service teachers with teaching confidence.

Moreover, a setting where pre-service teachers can reflect upon failure and discuss their possible selves will help them recognise the importance of reflective knowing for their development as teachers (Conway, 2001; Shapiro, 2010; Urzúa & Vásquez, 2008). In particular, becoming aware of their past stories of failure and how they may link to their future as teachers may help pre-service teachers revisit how they see their past and become active agents of their own development (see, e.g., Lutovac & Kaasila, 2012). In this study, pre-service teachers narrated how they intend to do things differently and be different than their own teachers, which supports the idea that narrated possible selves carry agentic qualities (Erikson, 2007)—pre-service teachers' possible selves display a link between the past failure and future teaching, much akin to what Rodgers and Scott (2008) labelled as 'the psychological shift from being authored by these forces to authoring their own stories' (p. 733). The findings in this study also suggest that teacher education settings could initiate a discussion about the importance of self-development. Pre-service teachers could be cued to reflect upon their strategies for how to achieve the desired or avoid the non-desired future. For example, if they project a possible self as 'being a fair teacher' or 'being a teacher who teaches for understanding of all students', they should also reflect upon the knowledge and actions needed in order to achieve it. This too will help them become more proactive and agentic.

Finally, the comparison of the two cohorts of pre-service teachers in terms of their meaning-making process and narrated possible selves demonstrates that regardless of differing personal histories—differing experiences of failure—the two cohorts of pre-service teachers' identity processes are more alike than anticipated. Indeed, they narrated the same kinds of possible selves, with differences observed within the possible selves categories rather than between them. This is important, as possible selves in question reflect similar salient needs of these two cohorts of pre-service teachers. For teacher educators, this may open up a possibility to address their needs within the joint courses, enabling them opportunities to learn from each other and becoming aware of dichotomies within possible teacher selves categories created as a result of personal meaning making of experienced failure. As one of the rare accounts of possible selves in mathematics education context, this paper hopes to contribute to the collection of possible selves across the various disciplines and provide a cue for further explorations of possible selves in order to understand professional (identity) development of teachers who will teach mathematics as well as other subjects.

### Author statement

I am the sole author of the paper and have made a full contribution to the work.

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**Appendix. Categories and descriptors of possible teacher selves in pre-service elementary school and mathematics teachers' narratives of math failure**

Possible teacher selves	Pre-service elementary school teachers	Pre-service mathematics teachers
<b>Focus on teacher traits and actions</b>		
Possible selves that pertain to what pre-service teachers report themselves to be and/or to do in order to take math failure into account in their future teaching		
<b>Sensitivity regarding students and their failure</b>	Noticing students who struggle Supporting struggling students Taking into account all students Making sure all students learn Understanding different students Avoid labelling Avoid categorising Thinking before speaking Supporting students Encouraging students Being inspiring, mindful Motivating students	Noticing failure/difficulties Taking into account all students (including stronger ones) Understanding different students Understanding students' perceptions of failure Not comparing students
<b>Using different instructional strategies</b>	Individual learning support Teach for understanding of all students Differentiation Fair assessment Varied and interactive teaching methods Concrete examples Teaching for successful experiences Fun and interesting lessons Finding alternative strategies (e.g., students teaching students) Creating competition-free classroom	Being encouraging and motivating Being inspiring  Fair assessment Varied and interactive teaching methods Giving feedback to motivate
<b>Focus on student strategies</b>		
Possible selves that pertain to the strategies pre-service teachers report their students need with respect to math failure.		
	Care Persevere Work hard Practice Let go of perfectionism Know that failure is natural Failure is okay Maintain your confidence Think about your future studies	Know your strengths Learn from failure Self-assess Accept failure, acknowledge weaknesses and move on Know that failure is okay
<b>Focus on teacher self-development</b>		
Possible selves that pertain to what pre-service teachers report they need to develop in order to take math failure into account in their future teaching.		
	Stronger math knowledge Better confidence Better pedagogical content knowledge Be kinder with oneself More experience	Knowledge of what students need

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