1-2022

The search for the sense of agency in vulnerable situations in mathematics teachers' initial education

Paulo Henrique Rodrigues

Márcia Cristina de Costa Trindade Cyrino

Hélia Margarida Oliveira

Follow this and additional works at: <https://scholarworks.umt.edu/tme>

Let us know how access to this document benefits you.

Recommended Citation

Rodrigues, Paulo Henrique; de Costa Trindade Cyrino, Márcia Cristina; and Oliveira, Hélia Margarida (2022) "The search for the sense of agency in vulnerable situations in mathematics teachers' initial education," *The Mathematics Enthusiast*: Vol. 19 : No. 1 , Article 9.

DOI: <https://doi.org/10.54870/1551-3440.1548>

Available at: <https://scholarworks.umt.edu/tme/vol19/iss1/9>

This Article is brought to you for free and open access by ScholarWorks at University of Montana. It has been accepted for inclusion in The Mathematics Enthusiast by an authorized editor of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.

The search for the sense of agency in vulnerable situations in mathematics teachers' initial education

Paulo Henrique Rodrigues¹
Universidade Estadual de Londrina

Márcia Cristina de Costa Trindade Cyrino²
Universidade Estadual de Londrina

Hélia Margarida Oliveira³
Instituto de Educação, Universidade de Lisboa

Abstract: The aim of this study is to analyse the actions of prospective mathematics teachers (PMTs), triggered in preparation for their teaching practicum (TP), to foster their autonomy when seeking their sense of agency in the face of a vulnerability, in the movement to construct their professional identity. To this end, we have carried out a qualitative research about the practicum lesson plans and the simulations of those lessons by PMTs who attended the same class in two disciplines of the Supervised Curricular Teaching Practice, in the last two years of the mathematics teaching degree course of the State University of Londrina (UEL). The identified vulnerability experiences enabled the search for the PMTs' sense of agency regarding the following actions: defining concepts with which the students had already had contact and problematising them to systematise a mathematical idea; resorting to previous experiences worked with potential basic education students; having support from colleagues for possible actions to be developed in the classroom; problematising the answer to a problem; reflecting on and answering questions; evaluating a classroom situation and concluding that it is necessary to give in so that the other also plays a leading role; assuming a coherent position to what they believe about education; and questioning students. These actions express the reactions of PMTs when exercising their autonomy, in the search for the sense of agency, mediated by other PMTs and teacher educators involved in the formative process. The experiences of vulnerability and the search for the sense of agency articulate altogether singular, individual, and collective aspects that expand the movement of the construction of the teacher's professional identity.

Keywords: Mathematics Education, Teacher Identity, Agency, Vulnerability.

Introduction

The movement of construction of teachers' professional identity (PI) has represented an emerging research theme (Beijaard, Meijer, & Verloop, 2004; Hong, Francis, & Schutz, 2018; Lasky, 2005), with some relevance with regard specifically to the (prospective) teacher who teaches mathematics (Cyrino, 2018a; Losano & Cyrino, 2017; Molfino & Ochoviet, 2019; Oliveira & Cyrino, 2011). This theme has been

¹ hrpaulo.91@gmail.com

² marciacyrino@uel.br

³ hmoliveira@ie.ulisboa.pt

studied in several fields, including teacher education, for providing elements that support the development of the (prospective) teacher in the cognitive, affective, and motivational domains (De Paula & Cyrino, 2020; Oliveira & Hannula, 2008; Soini et al., 2016).

PI is recognised as a critical factor that shapes and is shaped by teachers' professional lives, quality of teaching, motivation to teach, career decision making, emotions, willingness, and ability to sustain their political commitments, and ways of dealing with educational public policies (Cyrino, 2017, 2018b; De Paula & Cyrino, 2020). The movement of construction of the PI is a complex, dynamic, temporal, and experiential process, because it involves different aspects: personal, intellectual, emotional, contextual, political, family matters, formative, historical, among others. It also involves how people see us and how we see ourselves and reflect on our experiences (Cyrino, 2016, 2017, 2018a; De Paula & Cyrino, 2017; Kelchtermans & Hamilton, 2004; Oliveira & Cyrino, 2011).

We assume in this article that the movement of construction of the PI of teachers who teach mathematics takes into account “[...] a set of beliefs and conceptions interconnected to self-knowledge and knowledge about their profession, associated with autonomy (vulnerability and sense of agency) and political commitment” (Cyrino, 2017, p. 702).

Autonomy, the central theme of this research, has a direct and inseparable relationship with individuality (self) and with collective aspects (social, cultural, political, etc.). For this, and for other reasons, autonomy integrates itself in the movement of construction of the PI. For the development of self-understanding (self-image, self-reflection and self-evaluation) (Kelchtermans, 2009) and autonomy, both vulnerability and the search for the sense of agency play a fundamental role in the process of teacher education. However, there is still a limited understanding of how those processes are developed and articulated in teacher education, namely, how different elements of the training context relate to the development of prospective teachers' sense of professional agency (Soini et al., 2016)

Considering that the Supervised Curricular Teaching Practice is characterised as a space in which the prospective mathematics teacher has the opportunity to experience and problematise the field of his/her future profession, the focus on professional identity can help us explain the dialectical relationship between

teaching practice and what they expect from their performance (Molfino & Ochoviet, 2019). In this sense, we ask ourselves about what actions can prospective teachers trigger in teacher education experiences in the stages of this Practice (Observation, preparation for the Teaching Practicum (TP), Practicum, and preparation of the final report of the practice), to promote the construction of their identity.

In this way, this article aims to analyse the actions of the prospective mathematics teachers (PMTs), triggered in the preparation for their teaching practicum (TP)⁴, to foster their autonomy when seeking their sense of agency in the face of a vulnerability, in the movement to construct their professional identity.

Next, we present the perspective of the PI we assume in this study, particularly with regard to the autonomy triggered in the search for the sense of agency in experiences of vulnerability, the context of the investigation, the research methods, followed by the data analysis, and some final considerations.

Movement of construction of mathematics teachers' professional identity

We use the expression “movement of construction” of the PI because we understand that this is not a characteristic predetermined by our personality; it is (re)constantly negotiated in the course of our lives, taking into account our relations with each other. According to Hall (2015), identity is “continuously formed and transformed in relation to the ways in which we are represented or challenged in the cultural systems that surround us” (pp. 11-12). The PI is a coherent, temporal, situated, and singular system of ideas, concepts, and representations. It “is structured and modified from the reflective and significant interactions between the (prospective) teacher and the social, cultural, and structural conditions that form the context of his/her work” (Cyrino, 2018b, p. 6).

Taking into account these assumptions, there are several interconnected domains to be considered in the movement of construction of the PI of teachers who teach mathematics, namely: beliefs/conceptions, self-understanding, knowledge/know-how about the teaching profession, autonomy (vulnerability and sense of agency), political commitment, and emotions (Cyrino, 2016, 2017, 2018a).

⁴ The Teaching Practicum corresponds to one of the stages of the Supervised Curricular Teaching Practice, in which prospective teachers develop practices in basic education classrooms.

The central theme of this research is autonomy. In this work, it is defined as the individual's freedom and ability to make decisions and choices, conduct their own actions, perform, and assume to him/herself a critical character (Freire, 2000). It underlies the idea that the individual

Assumes oneself as a social and historical being, as a thinking, communicating, transforming, creative being [...]. The assumption of ourselves does not mean the exclusion of others. It is the "otherness" of the "not I," or of you, that makes me assume the radicality of my self. (Freire, 2000, pp.18-19).

We consider that the search for the sense of agency, when (prospective) teachers are facing experiences of vulnerability, contributes to the development of their autonomy. The vulnerability and the search for the sense of agency influence and shape the way the subject develops his/her trajectory, as well as how he/she acts (or does not act) in different social environment (Kelchtermans, 2009). Autonomy has a direct and inseparable relationship with individuality (*self*) and with collective aspects (social, cultural, political, etc.). Individuality can be directly associated with the subjects' particular experiences, the way they reflect on those experiences, the ways of dealing with themselves and others before them; and directly influences the way teachers teach, develop professionally and react to educational changes (Molfino & Ochoviet, 2019; Oliveira, 2004). However, individual aspects are inseparable from collective aspects, since actions that are interpreted as individual always carry the voices of other "I's" (Kelchtermans & Hamilton, 2004).

The teacher's profession is extremely vulnerable, i.e., vulnerability is a structural characteristic of this profession (Kelchtermans, 2009). In several circumstances, teachers do not have full control of their work. They are subject to external elements that have strong implications on their actions, according to the interpretation they develop about them (Kelchtermans, 2019), such as curricular decisions, relationship with the school community (students' parents, school coordination and administration, educators, colleagues, etc.), political decisions, salary issues, working conditions, among others. The continued stimulation of reflection contributes to the (prospective) teachers revisiting themselves and becoming aware of their learning.

Kelchtermans (2009) discusses some elements that compose vulnerability in the teacher's profession, such as:

- Teachers do not control their working conditions. Their conditions are generally imposed on them.
- The validation of the teacher's work does not come only from students. Other social factors are difficult to control or change.
- Teachers do not have the option of "not acting" to support students' learning. Their judgments and decisions can always be questioned. And yet, taking responsibility for actions, judgments, and decisions is an inherent part of the profession.

Vulnerability is socially understood as a process that relates to different nuances of the singular trajectories of each subject, besides shaping how subjects act in different situations.

Vulnerability is a multidimensional, multifaceted emotional experience that individuals can feel in an array of contexts. It is a fluid state of being that can be influenced by the way people perceive their present situation as it interacts with their identity, beliefs, values, and sense of competence. It is a fluctuating state of being, with critical incidents acting as triggers to intensify or in other ways change a person's existing state of vulnerability. (Lasky, 2005, p. 901)

Thus, in the teaching profession, the experience of vulnerability can be paralysing, in the sense that it weakens, makes the teacher frail, that is, that it limits he/she as to the actions that can be developed from it (Oliveira & Cyrino, 2011). However, when we think about what initiatives can be developed in the formative contexts, we detach ourselves from the idea of these experiences of vulnerability that paralyse teachers and propose a notion of vulnerability as one that

[...] allows us to suspend for a few – more or less long, and more or less frequent – moments our certainties and convictions. The one that makes us question ourselves. Also vulnerability in the sense of exposing ourselves to others and, as such, being able to become a "target of criticism, of contestation." (Oliveira & Cyrino, 2011, p. 112)

Thus, teacher education contexts characterised by this vulnerability, which allow (prospective) teachers to suspend their certainties and convictions, can expand the movement of their PI, because they will enable them to seek the sense of agency to face such situations. According to Cyrino (2017), "[...] it is the vulnerability that ensures that the (prospective) teacher recognises his errors and limitations, reconciles his

conflicts and dilemmas arising from and related to his (future) teaching practice so that he can overcome them” (p. 705). In this sense, according to the author, actions are needed in different formative contexts that enable those involved to rethink their practices, beliefs, and conceptions, so that they can act, even in experiences of vulnerability, with the sense of agency (Cyrino, 2017).

The sense of agency, according to Lasky (2005), is part of a dynamic and complex process that shapes and is shaped by structural and cultural characteristics of society and school cultures, and, as such, it “is always mediated by the interaction between the individual (attributes and inclinations), and the tools and structures of a social setting” (Lasky, 2005, p. 900). Therefore, it makes sense to speak of a “mediated agency”. Every decision the teacher makes and every action are related to the past and the present, and shape the context for future action. Teachers are active agents in the educational process, even when acting passively in certain situations. Their actions are mediated by the structural elements of the environment in which they live, and by the available resources, standards, and external policies (Chong, 2011; Day, 2019; Kelchtermans, 2019; Lasky, 2005; Mansfield & Beltman, 2019; Ruohotie-Lyhty & Moate, 2016).

By sharing a conceptual model used in a professional learning project for teaching, Jackson et al. (2020) present agency as one of the themes that can have a significant impact on self-understanding and the development of the PMTs’ ability to respond to the needs of their future students in the classroom.

According to Beijaard, Meijer, and Verloop (2004), the search for the sense of agency is an element of the PI, because it concerns the need for teachers to be active subjects of their professional learning, in their own development, regardless of situations of vulnerability. The PI is involved in giving meaning to themselves as (prospective) teachers, and, for this reason, the search for the sense of agency is part of it. There are several ways (prospective) teachers can exercise the sense of agency, depending on their goals and the sources to achieve them. The way they explain and justify their educational practices reveal aspects of the movement of their PI.

Kelchtermans (2019) argues that agency plays a significant role in the first experiences of mathematics teachers. For him, the sense of agency involves the human capacity to interpret and evaluate the particular situations in which the person finds him/herself, and to act in the face of these situations, according to this

sense. Thus, teacher's agency involves not only the ability to execute specific tasks and actions successfully, but also the to analyse and evaluate their experiences in specific contexts.

Research context and methods

The present study was conducted in the context of two disciplines that, among other dimensions, integrate the organisation and management of the Supervised Curricular Teaching Practice. These disciplines are taught in the last two years (3rd and 4th years) of the mathematics teaching degree course of the State University of Londrina – UEL. These two are annual, and each has a workload of 6 hours per week (totalising 210 hours/year) and are usually taught by two teachers each year. A teacher, in two weekly hours (90 hours/year), is responsible for organising and managing the practice of the Supervised Curricular Teaching Practice in its different stages, namely: Observation, preparation for the Teaching Practicum (TP), Practicum, and preparation of the final report of the Practice. The other teacher, in four hours per week (120 hours/year), is responsible for discussing theoretical issues articulated with the practices.

In the context of this study, the first author of this article followed, for two years, the activities of a group of PMTs in these two disciplines. During the preparation for the TP, the PMTs, in pairs, had to elaborate a lesson plan to be worked on in the TP and then simulate the enactment of this lesson with their peers at the university. After this simulation, the PMTs put into practice this lesson plan with basic education students in the TP. In the third year, the PMTs prepared lessons involving mathematical content of elementary school and, in the fourth year, for the secondary school.

Simulations, at this teacher education stage, allow prospective teachers to experience a hypothetical classroom dynamics and teaching practices that can be monitored, adjusted, and repeated, as a way to discuss and reflect on aspects related to specialised knowledge of diverse mathematical contents and also learn how to negotiate norms and simulate principles (Myers & Rivero, 2019).

In the class simulation, in UEL, the PMTs who were not in the role of teacher and the teacher educators (the teachers responsible for the discipline, namely, Magna, Pamela,⁵ and the first author of this article) played the role of basic education students. After this simulation, we hold discussions so that those involved in the formative process could express their reflections and develop hypotheses of what could be improved for the TP.

We conducted a qualitative and interpretative research (Cohen, Manion, & Morrison, 2007) during the development of this stage of preparation for the TP. Data collection included the lesson plans (LP) for the TP and audiorecording of the class simulation (CS), shared with the participants of the discipline, and the discussions that occurred after this simulation (SD). In the presentation of the data, we indicate the source of data collection (LP, CS or SD), followed by the year of graduation of the respective prospective teacher.

For analysis, we considered the information collected with ten PMTs (Kimberly, Tiffany, Thomas, Britney, João, Diana, Antônio, Mariane, Jofilson, and Laura⁶) who had a significant participation in the discussions during and after the class simulation planned for the TP.

From our experiences as teacher educators, we observed that the scenario for this activity's development around the preparation for the TP would have the potential to be configured in a vulnerability environment, enabling the search for the sense of agency, and therefore for the movement of the construction of the PMTs' PI. From a first analysis of the data, we identified evidence of vulnerability experiences associated with how to deal with:

- the simulation of one basic education class in the group they attended as students/prospective teachers;
- a possible student's mathematical error;
- peer questioning;
- teacher educators when they played the role of students.

⁵ The educators' names are real, at their option.

⁶ The names of the prospective teachers are fictitious and were chosen by them. They signed an informed consent form for the research participation.

Those experiences of vulnerability allowed us to identify and analyse the PMTs' actions in the search for the sense of agency.

Experiences of vulnerability and the search for the sense of agency

In this section, we organise the presentation of the results considering the experiences of vulnerability identified in the analysis process referred to in the previous section, and identifying the PMTs' actions triggered in the search for the sense of agency.

Vulnerability when simulating a basic education classroom situation in the group they attend as students/prospective teachers

Prospective teachers' development of part of the preparation for the TP was a critical incident of an experience of vulnerability (Lasky, 2005), mainly because peers (other prospective teachers and teacher educators) assumed the role of *students*⁷. They shared several moments during the course, not only in the disciplines related to the Supervised Curricular Teaching Practice, but also at other times (for example, other disciplines, extension, and research projects, participation in a study group), which contributed to the establishment of power relations. Those relationships often manifested as the prospective teachers positioned themselves after their colleagues' simulations, which further intensified this experience. Some PMTs expressed that they were more nervous about this experience than they were about the TP. Even when the PMTs simulated the roles of basic education *students*, the situations of vulnerability still happened, that is, all of them felt exposed at that moment.

Before proposing the task in her lesson plan, Mariane introduced some information to the class.

Mariane *Our class has been prepared for an eighth grade. We will present and systematise a system of equations with the students. So (I consider that) they don't know systems of equations yet. Therefore, I ask you not solve it through (using the techniques of solving) systems of equations. First-degree equation is the only thing they've ever had studied on this subject.*

(CS, 3rd year).

⁷ From this moment on, in this article, we refer to the prospective teachers as students, as some of them assumed the role of students in the development of the tasks. For this, we will leave the term "students" in italics, to highlight that the prospective teachers are playing the role of students.

By presenting the requirements, Mariana was open to creating an environment that simulated an eighth-grade classroom. The way she dealt with this situation was particular, since the initiative to present the requirements was not usual among other prospective teachers (Lasky, 2005). In a moment of exposure, she sought her sense of agency by **defining possible concepts with which the students had already had contact**, so that the classroom experience was as close as possible to the practice she could find in basic education. Although it was not a situation likely to be controlled (Kelchtermans, 2009, 2019), Mariane established some guidelines with the class.

Joílson and Antônio developed the task “The roof of a house” (**Figure 1**).

Figure 1: Task “The roof of a house”

After reading the task, Joílson and Antônio asked the *students* to gather in groups to solve it. While they solved the task, the pair questioned and commented on the groups’ productions, without giving answers or validating any resolution. As soon as the *students* finished the task’s resolution, Joílson and Antônio promoted a collective discussion.

Antônio	<i>Did you already make a choice?</i>
Laura	<i>We chose c) for aesthetics.</i>
Antônio	<i>Any other reason?</i>
Laura	<i>We had thought of d), but we thought it would get too heavy.</i>

Joílson	<i>Heavy?</i>
Paulo⁸	<i>Well, we chose c) as well, but we had two reasons. The first was for aesthetics because we think it's beautiful. But by that argument, the letter e) would also be (a good choice). But we decided not to choose e), because in financial terms it would be very expensive.</i>
Magna	<i>I was gonna spend a lot of tiles.</i>
Joílson	<i>Paulo's group thought about financial and aesthetic aspects.</i>
Thomas	<i>We had four solutions [each one from Thomas, Diana, Kimberly, and Tiffany's group chose an alternative].</i>
Tiffany	<i>I chose b) for financial reasons.</i>
Joílson	<i>What's the other choice?</i>
Kimberly	<i>c) Aesthetics, symmetry, it calms me, it's beautiful...</i>
Joílson	<i>Aesthetics...</i>
Joílson	<i>What's the other [choice]?</i>
Diana	<i>a) For two reasons: because it is very high and I would like to have an attic.</i>
Joílson	<i>What about yours, Thomas?</i>
Thomas	<i>I chose roof b) because it is different, and I want my house to be different. And because my house will have a bathroom on this side (higher), and I want the water box to be on top of the bathroom and it will only fit if it goes to the side of here (higher). With the roof, with this big piece, I will make a cistern to accumulate water, because it will rain, more water will fall on this side (higher) and I will collect more water.</i>
Antônio	<i>Organisational aesthetics, then?</i>
[...]	
Antônio	<i>I realised that aesthetics and finance were the (factors) that weighed the most. But if you lived in a place that rained heavily, which roof would you choose?</i>

(CS, 3rd year).

Joílson and Antônio triggered a situation of intentional vulnerability. They chose to apply a task that had different possibilities of correct resolution. The justifications for the resolutions could be based on their beliefs and desires. Thomas, Diana, Kimberly, and Tiffany's group exemplified this well, since each *student* in the group chose a different roof and presented their justification. This situation indicates less control by Joílson and Antônio (Kelchtermans, 2009, 2019), which seems intentional to us.

We consider that Joílson and Antônio sought the sense of agency in the face of this situation of vulnerability, that appeared when they presented the task, since, in the discussion, they requested that *students* gave a justification to validate their answers. However, in the end, Antônio brought another variable: rain (already anticipated by Thomas). We observed that it was Joílson's and Antônio's intention to propose different viable alternatives, since both wanted to introduce an intuitive idea of angle, so that

⁸Paulo and Magna sometimes pretended to be basic education *students*.

they related the opening of the angles to the inclination of the roof and realised that the smaller the opening of the angle of the top of the roof, the greater its slope. The goal of prospective teachers when working with this task was to problematise the relationship between the roof top angle and the slope.

The **problematisation aiming at the systematisation of a mathematical idea**, although intentional, is configured as the search for the sense of agency in the face of a situation of vulnerability. In this case, we infer that the vulnerability manifested from the different *students'* resolutions to be a moment of less control (Kelchtermans, 2009, 2019).

The vulnerability associated with how to deal with a possible students' mathematical error

The prospective teachers, in some moments, were vulnerable when dealing with unexpected resolutions, characterised by some possible mathematical error. In that direction, João and Tiago, starting from the premise that the *students* knew what the fundamental principle of counting was, applied the task depicted in **Figure 2** to systematise the idea of simple permutation.

Figure 2: Task “The landscapes”

After the *students* worked in small groups to solve the task, João and Tiago selected some resolutions to be presented and discussed. Among the resolutions, João and Tiago chose one for which they had not found a plausible justification ($5 + 4 + 3 + 2 + 1 = 15$).

Tiago	<i>I will ask those who registered ($5 + 4 + 3 + 2 + 1 = 15$) to explain what they did.</i>
Kimberly	<i>I thought for each place I had at first five (possibilities of) figures. Five possibilities and then in the second, I only had four (possibilities of) figures, then four more, then three more and so on.</i>

João	<i>Why did you add, Kimberly?</i>
Kimberly	<i>Oh, I thought I had five possibilities for the first and four more in the other (second). I don't know, I added... Because I thought that for each one I had that many possibilities. It was decreasing because I was using it.</i>
João	<i>Our landscape is made up of all five images together. Do you think adding up you're adding up the total landscapes, or just the images?</i>
Kimberly	<i>I don't know, everyone's (answer) gave more than mine.</i>
João	<i>I don't know if that would be the case, but we were going to use the multiplicative principle that we systematised in the last class. As we saw in the last class, in the multiplicative principle, would this resolution be adequate?</i>
Kimberly	<i>I missed last class. But what was the principle?</i>
Tiago	<i>We believe that this will not happen in the sequence [a resolution like this, since they had just systematised the multiplicative principle]. I confess that I did not expect this resolution.</i>
João	<i>I hope to God you didn't.</i>

(CS, 4th year)

Even though they did not know why the resolution was wrong, João and Tiago selected it for discussion hoping for someone to present a justification. When questioned by the *students*, João resorted to the idea of the multiplicative principle that he had supposedly systematised in the previous class. We understand that **resorting to possible previous experiences** represents the way João dealt with this experience of vulnerability, i.e., it represented his search for the sense of agency (Oliveira & Cyrino, 2011). When the PMTs analysed this class, there was a discussion about the justification for the total amount of landscapes being determined by the product of the amounts of possible images in each position. At the end of this discussion, the group wondered why the prospective teachers had selected a resolution that they did not know how to justify its validity.

João	<i>I hadn't understood how she did it. Because you can't add up, you must multiply.</i>
Thomas	<i>There are five pieces, in the first she put five possibilities, because she is changing the first piece and the other four are the same. It's the same piece. If you change five times, the other four are the same, and there is no use changing them, because it will form the same frame.</i>
Tiago	<i>But the other four couldn't be the same in the first one, because there would be one.</i>
Thomas	<i>So, only it (the first figure) can be placed in five different places forming five frames. That's what she did. It's just two figure models. Did you get it?</i>
Tiago	<i>I see.</i>
Thomas	<i>Then in the second, she can change it five times too, only one will match the first, because she already had the same piece, so that's why she put only the four. Then just three, two and one.</i>
Tiago	<i>Even if we understand it, it is difficult to explain it to the students.</i>
Amanda	<i>Just a question, why did you put the resolution on the board?</i>
João	<i>At first, I thought someone might have some argument to help us.</i>

(SD, 3rd year)

In this dialogue, we observe that even in a situation of vulnerability, characterised by not knowing how to justify why a resolution is incorrect, João seeks his sense of agency when selecting the resolution, along with Tiago, considering that **he would have support from his colleagues** for the argument. The sense of agency relates to the past and present and can shape future situations (Lasky, 2005), as in this case, in which a doubt was implemented in the context of teaching and has the potential to be re-signified in the future, as in the development of the TP. This experience of vulnerability is configured as a means of preparation for the TP.

When they were in the fourth year of the degree course in mathematics, Thomas and Britney simulated the work with a task that involved volume and capacity (**Figure 3**).

Figure 3: Task “Volume and capacity”

After discussion in small groups, Kimberly and Karin presented the following resolution to *students*:

Karin *We use the string to measure the spinning-top, and first, divide the length (the largest diameter) of the cone to find the radius and then the volume of the cone. We subdivided the top into semisphere, cylinder, and cone.*

Kimberly *We calculated the volume of the cylinder, the semisphere, and the cone from the measurements and arrived at the three volumes. And then, we calculated the volume of the top and then the volume of the box. But since you also had the same problem, the top is chubby, and you can't fit them properly. Then we thought of calculating the volume of a parallelepiped, of small boxes isolated with the top. For every top. A*

	<i>box where the top would fit. The volume of this small box is 112 cm^3. Then, we found the volume of the box divided by the volume of this small box. And we found 4.62 (cm^3). So, we thought of five tops.</i>
--	---

(CS, 4th year)

After a while, Thomas discussed the resolution offered by Kimberly and Karin.

Thomas	<i>We assumed we couldn't cut the spinning-tops. In the calculation that the girls (Karin and Kimberly) made, they assembled the small boxes and concluded that four spinning-tops fit into those small boxes. And why did you still consider five?</i>
---------------	---

Karin	<i>Because we round it up.</i>
--------------	--------------------------------

Kimberly	<i>But we shouldn't, because in this case we would need to round it down.</i>
-----------------	---

Thomas	<i>They arrived at the answer, but did not see [analyse] the answer. Because when they made the parallelepiped around the spinning-top, they came to the conclusion that they could only fit 4 whole. The 0.62 left over would not form another entire parallelepiped for you to place [the top].</i>
---------------	---

(SD, 4th year)

We consider that Thomas went through an experience of vulnerability triggered by a possible mathematical error of Karin and Kimberly, which concerns the analysis of the solution they found. Even though the chosen answer was not the right one for the problem (be 4.62 or 5 instead of 4), Thomas and Britney decided to discuss it. The **questioning of the answer to the problem**, represented by the interpellation “And why did you still consider five?”, was configured as Thomas’s search for the sense of agency to face such a situation, whose control depended not only on him (Kelchtermans, 2009, 2019) but also on the *students* who presented the resolution. Also, the option for questioning allowed the *students* themselves to recognise the error and argue from it.

Vulnerability to be susceptible to peer questioning

In the discussion session, after the prospective teachers simulated a class in their very undergraduate group, the peers presented their considerations about what could be modified or improved. This moment revealed them as quite vulnerable, mainly because they had no control over the notes that would be presented, in the sense that, in some moments, negative analyses were evidenced (Kelchtermans, 2009, 2019). We understand that this practice was characterised as a critical incident for prospective teachers (Lasky, 2005).

An experience of vulnerability that paralysed them⁹ can also be observed in the work of Diana and Regina, in the 4th year, discussed below. They applied the following task (**Figure 4**), whose objective was to introduce the concept of sequence.

Given ice-cream sticks, we build these figures:

Drawing 1 Drawing 2 Drawing 3

Given that the drawings follow a pattern, answer the following questions:

- How many sticks will be needed to form the drawing number 4?
- How many sticks will be needed to form 20 triangles?
- How many triangles can be formed with 155 sticks?
- Is there any drawing in which we used 260 sticks? If positive, what is its position?

Figure 4: Task “The sticks”

In the 4th year, Diana found it hard to discuss the mathematical concept she wanted to introduce. She was unable to articulate the *students’* resolution and discussion with what she wanted to introduce again (the concept of sequence). Regina was unable to support her, even with the *students’* encouragement. As Diana and Regina found it difficult to systematise the concept of sequence, and, consequently, did not reach the objective they intended, they were asked, at the time of the questions, to read the definition they wanted to systematise (**Figure 5**).

Definition: A finite sequence of n elements is a function whose domain is the set $\{1, 2, 3, \dots, n\}$ and the counter-domain is a nonempty set. In other words, the sequence f in which $D(f) = \{1, 2, 3, \dots, n\}$ is indicated by $(a_1, a_2, a_3, \dots, a_n)$ where $a_1 = f(1), a_2 = f(2), \dots, a_n = f(n)$ is a finite sequence.

Source: Adapted from the textbook “Matemática, uma nova abordagem” – 2013

Figure 5: Sequence definition

Considering that it was the *students’* first contact with the definition of sequence, Kimberly and the teacher educators questioned them.

Kimberly *Congratulations to both of you... I was frightened by the definition of sequence, I think you have to make a good relationship of all that you did with the definition. I found it heavy, “function and such...”.*

⁹ In the sense of limiting the subject as to the actions that can be developed.

Paulo ¹⁰	<i>So, do you? Do you need to associate the function at this time?</i>
Pamela	<i>Don't you have a more intuitive idea of what sequence is? Without relating it to function?</i>

(SD, 4th year)

As a result of the comments, when applying part of the lesson plan, the PMTs expressed resistance to modify it. They defended the maintenance of such a definition, even after the questions, and argued that this relationship could be established from a table that indicated the results of the task (**Figure 6**). According to them, if any student did not present a resolution using the table, they would present it in the discussion.

FIGURE	1	2	3	4	5	...	20
NUMBER OF STICKS	3	5	7	9	11		?
NUMBER OF TRIANGLES	1	2	3	4	5	...	20

By naming the first term a_1 , the second term a_2 , and so on, we can indicate a term of any order by a_n . Indicating this sequence as finite:

Definition: A finite sequence of n elements is a function whose domain is the set $\{1, 2, 3, \dots, n\}$ and the counter-domain is a nonempty set. In other words, the sequence f in which $D(f) = \{1, 2, 3, \dots, n\}$ is indicated by $(a_1, a_2, a_3, \dots, a_n)$ where $a_1 = f(1), a_2 = f(2), \dots, a_n = f(n)$ is a finite sequence.

Source: Adapted from the textbook "Matemática, uma nova abordagem" – 2013

Figure 6: Part of Diana and Regina's lesson plan

Mariane and Leonardo, after simulating part of the TP in the 4th year, also listened some points regarding their performances. The comments came from Rafaela and were confirmed by Paulo, taking into account what they had observed in the 3rd year, in which Leonardo has shown shy and introspective.

Rafaela	<i>Leonardo has improved 1000%.</i>
Paulo	<i>He is much more communicative [compared to the 3rd year].</i>
Rafaela	<i>You could see [in the 3rd year] that he was tense. Not right now.</i>
Leonardo	<i>But I was tense here too.</i>
Rafaela	<i>But now you've interacted with the groups.</i>
Paulo	<i>Last year you got a lot of criticism. And now you need to be praised. Including the interaction between the two of you [Mariane and Leonardo].</i>
Rafaela	<i>Also, he started asking the students questions.</i>
Leonardo	<i>Last year, I did wrong things. I chose resolutions to be presented on the board without talking to Mariane.</i>

¹⁰ In the moments of questioning signaled, Paulo, Magna, and Pamela played the roles of teacher educators.

Paulo	<i>[This year] the two of you [Mariane and Leonardo] discussed [negotiated before making a decision].</i>
--------------	---

(SD, 4th year)

From this dialogue, we observe that Leonardo sought the sense of agency for a situation of vulnerability manifested in the 3rd year. He was criticised for not having taken a standpoint in many moments, and because Mariane played the leading role during the application. **Answering to their arguments** was a means to seek the sense of agency in that context.

We observed that not only Leonardo had a different attitude regarding the situation, but Mariane as well. She allowed Leonardo to play a leading role as a teacher, which was a novelty considering her background throughout the course (in other activities). The search for the sense of agency is not necessarily the search to speak more, to be more communicative. It may also be associated with **evaluating a situation and concluding that it is necessary to give in so that the other person also plays a leading role**; that is to retreat. However it is not “a retreat” concerning a possible weakening that a situation of vulnerability can promote, but to put oneself in the place of the other, and to give space to the other. Facing a situation of vulnerability may be giving in so that the other also plays a leading role, which happened in this case.

This shows the challenge and potential of working in pairs. This strategy expands the possibilities for teacher education and therefore for the movement of construction of the PI, precisely because it allows this interaction. The experience of vulnerability associated with dealing with colleagues’ questions for their performance did not represent something that paralysed them, so as not to react to a situation of vulnerability. On the contrary, from the comments, they were able to re-signify their own formative processes.

Vulnerability associated with how to deal with teacher educators when they play students

The experience of the teacher educators assuming the role of basic education *students* in the simulation of part of the lesson plans for the TP was a vulnerability for the PMTs, mainly because the teacher educators always comment at the end of the discussions of the resolutions.

In the discussions, the PMTs avoided selecting the resolutions the educators/trainers presented (when they played the role of *student*) to achieve the teaching objectives they intended. The verb “avoid” in this sense is intentional, so that such a characteristic of the context may be associated with a possible escape from a situation that paralysed them (Oliveira & Cyrino, 2011). For example, they monitored and guided the resolutions with their colleagues, but avoided doing this with the educators/trainers, who also represented *students* at this time. They did not question what was presented by a person who was considered “hierarchically superior.”

We interpret that this experience of vulnerability is mainly related to power relations that often exist in educational environments, in the sense that social roles are established in different positions (Kelchtermans, 2009).

An example of a search for the sense of agency in the face of this situation of vulnerability can be observed in Laura and Amanda’s work. They developed the task described in **Figure 7** to discuss the concept of a system of equations.

Task 1	
<p>In a series of 8 games by the Brazilian Soccer Championship, The Londrina Esporte Clube (LEC – Shark) scored 14 points. Knowing that for each victory they count 3 points, for each tie 1 point is counted, and that Shark did not lose any game before, find the number of winnings and ties.</p>	
<p>Source: Adapted of Bonjorno, 2006, 82 p.</p>	

Figure 7: Task “LEC-SHARK”

Paulo, simulating the role of *student* when solving the task, discusses with Laura.

Laura	<i>How did you solve it?</i>
Paulo	<i>I divided 14 by 3.</i>
Laura	<i>How much was it?</i>
Paulo	<i>That’s four wins and two draws.</i>
Laura	<i>Did you read the statement?</i>
Paulo	<i>“In a series of 8 games for the Brazilian Football Championship, Londrina Esporte Clube (LEC - Shark) accumulated 14 points. Knowing that with each win 3 points are counted, with each draw 1 point, and that Shark did not lose any of the games played, find the number of wins and draws.”</i>
Laura	<i>By dividing, is it possible to find the number of wins and draws and the number of games?</i>
Paulo	<i>Oh, let’s think, here I have 2 draws and 4 wins.</i>
Laura	<i>How many games are there?</i>

Paulo	<i>Six games.</i>
Laura	<i>How many games were there in the statement?</i>
Paulo	<i>Oh, it was eight.</i>
Laura	<i>It was eight, think a little bit more.</i>
Paulo	<i>Okay, teacher.</i>

(CS, 3rd year)

Laura sought her sense of agency for this situation of vulnerability by **questioning the teacher educator** and requesting that the *student* (teacher educator) read the task's statement again, so that he arrived at a conclusion himself. We believe this to be a moment of uncertainty for Laura as to what actions she would develop (Lasky, 2005; Oliveira & Cyrino, 2011), since, in addition to being one of the teacher educators pretending to be a *student*, he offered an incorrect resolution.

When the teacher educators pretended to be *students*, the prospective teachers could learn how to deal with aspects involving power relations and hierarchy that exist in educational environments. Actions are not neutral. People are socially legitimised to play different roles that, whether they want it to or not, are developed in hierarchical contexts. Inevitably, power relations are established, in the sense that social roles are established in different positions. We consider that, by mobilising her sense of agency, Laura legitimised a possible way of dealing with hierarchy and power relations (Kelchtermans, 2009, 2019).

Potentialities of the actions triggered by the experiences of vulnerability and the search for the sense of agency

In Table 1, we associate the experiences of vulnerability analysed in the previous section with the respective actions triggered by the PMTs in the search for the sense of agency.

Table 1: Vulnerability and actions triggered in the search for the sense of agency

Vulnerability associated with how to deal with	Actions triggered in the search for the sense of agency
the simulation of a basic education class in the group they attend as students/prospective teachers;	<ul style="list-style-type: none"> defining possible concepts that the students had already had contact with; problematising aiming at the systematisation of a mathematical idea.
a possible student's mathematical error;	<ul style="list-style-type: none"> drawing on possible previous

	<ul style="list-style-type: none"> experiences; • having support from colleagues; • questioning the answer to a problem.
peer questioning;	<ul style="list-style-type: none"> • reflecting on and respond to questions; • evaluating a situation and concluding that it is necessary to give in so that the other also plays a leading role; • taking a coherent position to what they believe.
teacher educators when they play the students' role.	<ul style="list-style-type: none"> • questioning the educator/trainer.

We consider that those actions, triggered in experiences of vulnerability, are essential for the movement of the construction of the PMTs' PI. **The definition of possible concepts with which the students had already had contact and the problematisation of mathematical ideas** were ways for them to deal with the experience of simulating a situation in the classroom in their own group of students/prospective teachers. Both actions are directly related to what can be done by the teacher to teach mathematics. Situations of vulnerability that favour the search for the sense of agency, such as those ones, allow not only the study/anticipation of the actions that can be developed in the classroom but also become a way to experience them. Such possibilities have implications that can modify the repertoire of prospective teachers' knowledge and beliefs. According to Ruohotie-Lyhty and Moate (2016), ways to exercise the sense of agency influence prospective teachers in the construction of new knowledge.

In this sense, we understand that actions like these expand the movement of construction of the PI, not only related to the autonomy, but also in its relationship with others of its aspects, such as morality and political commitment, since they allow the resignification of what teachers believe to be correct for teaching (moral) and how the teacher relates to peers (political commitment) (Cyrino, 2017; Cyrino, 2018b; Kelchtermans, 2009; De Paula & Cyrino, 2020).

Resorting to possible previous experiences is related to the movement of construction of the PI in that it enables the PMTs to analyse their trajectories, seeking already-known strategies to deal with a present situation. The results of the experience of dealing with that situation may influence the change in the internalised certainties and convictions (Kelchtermans, 2009) since they enable their resignification. Also,

resorting to previous experiences to deal with a specific situation enables (prospective) teachers to recognise their formative process as a movement without a beginning and an end, characterised by the constant modification of the arsenal of strategies to deal with different situations (Cyrino, 2017; Cyrino, 2018a; De Paula & Cyrino, 2020). Such an approach makes it possible to recognise the trajectory of (prospective) teachers as singular, specific, and unique, which changes frequently, and which is used as support to deal with vulnerability experiences (Day, 2019; Kelchtermans, 2019; Ruohotie-Lithy & Moate, 2016). That is, it allows recognising the professional training process supported by the movement of construction of the PI.

Having the support of colleagues influences the movement of construction of the PI, because it brings the dimension of the other to the individual actions. Relationships with the other, the meanings that are attributed by others to their actions, and the way others analyse their actions to offer help are aspects that influence who a subject is and how he/she acts in the face of different situations, thus impacting on his/her self-image and self-esteem (Kelchtermans, 2019; 2010; Lasky, 2005). The other has a fundamental role in the self-understanding of the (prospective) teachers, since their action can influence the way they see themselves (self-image) and the way they evaluate themselves (self-esteem). This result corroborates the statement of Soini et al. (2016) that pedagogical practices that enable constant interaction between peers are related to the development of the professional agency.

Questioning the answer to a problem is also associated with classroom-specific questions, bringing implications for beliefs and knowledge necessary for professional performance. It also allows a reflection on what the (prospective) teacher considers to be *correct* to be developed in the classroom. The meaning of the term correct, in this context, is not universal, in other words, it does not correspond to a single way of seeing the world (Day & Gu, 2007). However, this term may make sense in their personal trajectory. Because it is related to the teachers' convictions as to what they believe is correct to develop in the classroom (Kelchtermans, 2009, 2019), questioning the answer to a problem is associated with the moral dimension of the movement of construction of the PI.

Reflecting on and responding to peer questionings enables the subject to evaluate who raises the points and recognise whether this makes sense within their beliefs, knowledge, self-understanding, etc. Besides, there is the legitimization of the other as someone worthy of note (or not). If the subject validates the action of the other, then the chance to consider their questionings, and to modify their actions, increases considerably. This action is mainly associated with the political dimension of the movement of construction of the PI, since it is based on how the subject relates to his peers and how he legitimises them. This evidences a context of power relations, which are influenced, among other aspects, by the legitimacies (or non-legitimacies) that the subjects attribute each other.

Evaluating a situation and concluding that it is necessary to give in so that the other also plays a leading role also relates to the role of the other in the movement of constructing the PI, especially in the development of empathy, of putting oneself in the place of the other, and thinking in the best conditions so that the other is free to act. This brings internal reflection on how people behave in different situations. Empathy is understood as a political commitment, insofar as it is not limited to the ability to project on the other, but as a commitment to the other in the search to collaborate so that they develop their agency. As stated by Ruohotie-Lyhty and Moate (2016), the role of the group is fundamental in initial teacher education, from a relational context perspective, leading to questioning about the identifications that are possible.

Taking a coherent position to what is believed expands the movement of construction of the PI in the sense of impacting on their beliefs. By feeling the need to reaffirm what they believe through an action, the (prospective) teachers mobilise the set of beliefs and certainties they have, questioning and reinforcing their convictions. Depending on what one has as a result of such actions, beliefs can be modified or maintained. Moreover, taking a coherent position to what is believed is to reinforce the moral dimension of the movement of construction of the PI, since it reaffirms what the subject believes is correct to act in a given situation (Kelchtermans, 2010, 2019).

The vulnerability associated with how to **deal with the educators when they acted as students** allowed the PMTs to ask questions the educator questions, which was associated with the movement of construction

of the PI mainly with regard to questioning the other, even in a context with explicit power relations. This action is mainly related to the political dimension, since it shows how relations are established, from the point of view of the legitimation of knowledge by the other. This situation may arise from the fact that, contrary to what is referred to in the study by Soini et al. (2016), these PMTs view the training environment as being constructive and, as such, contributing to the exercise of their agency.

Final considerations

The actions triggered from the experiences of vulnerability represented by the search for the sense of agency were analysed in this article in the context of the movement of construction of the PI, which allowed us to identify contributions to the process of formation of the PMTs in the preparation for their TP (teaching practicum).

The search for the sense of agency, in this context, is specific to the situations analysed. If we had selected other episodes, we would possibly find other actions, which indicates that the search for the sense of agency is not universal, and is part of the movement of construction of the PI of each (prospective) teacher, since the way each person deals with the world is particular (albeit influenced by the social).

The actions highlighted represent how the MPTs reacted to the experiences of vulnerability, that is, they represent how they exercised the sense of agency and, therefore, allowed the mobilisation of an aspect of PI, autonomy, taking into account their self-understanding. The dialectical relationship between teaching practice and what prospective teachers expect from their performance can be explained by the search for construction of their professional identities, as it promotes a relationship between what the subject believes and how they relate to peers (colleagues, trainers, students, etc.). Although the practice of simulation naturally has limitations as pointed out by Myers and Rivero (2019), the fact is that it constitutes a context that can raise the self-questioning of prospective teachers regarding their beliefs and conceptions, supporting the process of self-understanding as a teacher.

The four situations of vulnerability were recurrent in the simulation activity of a class to be developed in the TP. However, the way they impacted each prospective teacher was a **singular** part of the movement of construction of the PI of each one.

Some prospective teachers, for example, felt fragile in the face of experiences of vulnerability. Others sought the sense of agency in the face of such experiences. Therefore, they **are not universal**, either.

In this sense, we do not argue that formative contexts are free of experiences of vulnerability that weaken or paralyse (prospective) teachers. They are part of every formative process and also of the movement of construction of the PI. However, when we think of the interventions to be proposed for teacher education, we consider that the experiences of vulnerability that enable the search for the sense of agency expand the movement of construction of the PI, since they have an impact on their beliefs, knowledge, self-understanding, and autonomy, as was the case in this study.

We considered as a limitation of this study the fact that we did not analyse the practice of prospective teachers in the TP. Other investigations can analyse the presence of the actions identified in this study in different contexts of the Supervised Teaching Practice that are potential for mobilising experiences of vulnerability and the sense of agency. Further research may focus on mediated agency, to explain how social aspects are specifically related to individual actions, bringing implications for the present and the future. Furthermore, investigating characteristics of situations of vulnerability that may limit or expand teachers' search for their sense of agency seems to represent an open field of PI-related investigations. However, we recognise the potential of our study for the current research scenario, especially regarding teacher education. It reinforces the evidence that many other factors influence our practices and lives as teachers, beyond the knowledge inherent in the curricular component that will be part of our practice. This knowledge is necessary, but it is not enough. Analysing how these factors are mobilised allows us to consider (prospective) teachers as they are, as unique beings in the world, with specific stories, desires, emotions, and needs.

Acknowledgments

We thank the Coordination for the Improvement of Higher Education Personnel – CAPES for the doctoral scholarship of the first author, the National Council for Scientific and Technological Development – CNPq for the research productivity scholarship of the second author, as well as the prospective teachers who participated in this study. This study was partially supported by CNPq/Brazil.

References

- Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education*, 20, 107-128.
- Chong, S. (2011). Development of teachers' professional identities: from pre-service to their first year as novice teachers. *Korean Educational Development Institute Journal of Educational Policy*, 8(2), 219-233.
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education*. (6th Edition). New York: Routledge.
- Cyrino, M.C.C.T. (2016). Mathematics teachers' professional identity development in communities of practice: Reifications of proportional reasoning teaching. *BOLEMA: Boletim de Educação Matemática*, 30, 165-187.
- Cyrino, M.C.C.T. (2017). Identidade Profissional de (futuros) Professores que Ensinam Matemática. *Perspectivas da Educação Matemática*, 10, 699-712.
- Cyrino, M.C.C.T. (2018a). Prospective Mathematics Teachers' Professional Identity. In M. Strutchens, R. Huang, D. Potari, & L. Losano (Eds.), *Educating Prospective Secondary Mathematics Teachers. ICME-13 Monographs* (pp. 269-285). Cham, Switzerland: Springer. DOI: https://doi.org/10.1007/978-3-319-91059-8_15
- Cyrino, M.C.C.T. (2018b). Grupos de estudo e pesquisa e o movimento de constituição da identidade profissional de professores que ensinam matemática e de investigadores. *Revista de Ensino de Ciências e Matemática (REnCiMa)*, 9, 1-17.

- Day, C. (2019). Quality Retention and Resilience in the Middle and Later Years of Teaching. In A. Sullivan, B. Johnson, & M. Simons (Eds.), *Attracting and keeping the best teachers: Issues and opportunities* (pp.193-210). Springer International Publishing.
- Day, C., & Gu, Q. (2007). Variations in the conditions for teachers' professional learning and development: Sustaining commitment and effectiveness over a career. *Oxford Review of Education*, 33(4), 423-443.
- De Paula, E. F., & Cyrino, M.C.C.T. (2017). Identidade profissional de professores que ensinam Matemática: panorama de pesquisas brasileiras entre 2001-2012. *Zetetiké*, 25(1), 27 – 45.
- De Paula, E. F., & Cyrino, M. C. C. T (2020). Aspectos a serem considerados em investigações a respeito do movimento de constituição da Identidade Profissional de professores que ensinam matemática. *Educação* (Santa Maria), 45, 1-29.
- Freire, P. (2000). *Pedagogia da autonomia: saberes necessários à prática educativa* (25ª ed.). São Paulo: Paz e Terra.
- Hall, S. (2015). *A identidade cultural na pós-modernidade* (12ª ed., Tradução de Tomaz Tadeu da Silva e Guacira Lopes Louro). Rio de Janeiro: Lamparina.
- Hong, J., Francis, D. C., & Schutz. (2018). Research on Teacher Identity: Common Themes, Implications, and Future Directions. In P. A. Schutz, J. Hong, & D. C. Francis (Eds.), *Research on Teacher Identity: Mapping challenges and innovations* (pp. 243-251). Cham, Switzerland: Springer International Publishing.
- Jackson, B., Hauk, S., Tsay J. J., & Ramirez, A. (2020). Professional development for mathematics teacher education faculty: Need and design. *The Mathematics Enthusiast (TME)*, 17, 537-582.
- Kelchtermans, G. (2009). Who I am in how I teach is the message: self-understanding, vulnerability and reflection. *Teachers and Teaching: theory and practice*, 15(2), 257– 272.
- Kelchtermans, G. (2019). Early career teachers and their need for support: Thinking again. In A. Sullivan, B. Johnson, & M. Simons (Eds.), *Attracting and keeping the best teachers* (pp. 83-99). Springer International Publishing.

- Kelchtermans, G., & Hamilton, M.L. (2004). The dialectics of passion and theory: Exploring the relation between self-study and emotion. In J. Loughran, M.L. Hamilton, V. Kubler, V. Laboskey, & T. Russell (Eds.), *The international handbook of self-study of teaching and teacher education practices*. (pp. 785-810). Dordrecht: Kluwer Academic Publishers.
- Lasky, S. (2005). A sociocultural approach to understanding teacher identity, agency and professional vulnerability in a context of secondary school reform. *Teaching and Teacher Education*, 21(8), 899-916.
- Losano, L., & Cyrino, M.C.C.T. (2017). Current research on prospective secondary mathematics teachers professional identity. In M. E. Strutchens, R. Huang, L. Losano, D. Potari, J. P. da Ponte, M. C. C. T. Cyrino, & R. M. Zbiek (Eds.), *The Mathematics Education of Prospective Secondary Teachers Around the World* (pp. 25-32). Cham, Switzerland: Springer International Publishing. DOI: https://doi.org/10.1007%2F978-3-319-38965-3_4
- Mansfield, C., & Beltman, S. (2019). Promoting resilience for teachers: pre-service and in-service professional learning. *The Australian Education Researcher*, 46, 583–588.
- Myers, J. P., & Rivero, K. (2019). Preparing globally competent preservice teachers: The development of content knowledge, disciplinary skills, and instructional design. *Teaching and Teacher Education*, 77, 214-225.
- Molfino, V., & Ochoviet, C. (2019). A mathematics teacher's identity study through their teaching practices in a postgraduate training course. *The Mathematics Enthusiast (TME)*, 16, 389-408.
- Oliveira, H. (2004). Percursos de identidade do professor de Matemática em início de carreira: O contributo da formação inicial. *Quadrante*, 13(1), 115-145.
- Oliveira, H. M., & Cyrino, M.C.C.T. (2011). A formação inicial de professores de Matemática em Portugal e no Brasil: narrativas de vulnerabilidade e agência. *Interacções*, 7, 104-130.
- Oliveira, H., & Hannula, M. (2008). Individual prospective mathematics teachers: Studies on their professional growth. In T. Wood (Series Editor) & K. Krainer (Volume Editors), *International*

Handbook of Mathematics Teacher Education (Vol. 3, pp. 13-34). Rotterdam, The Netherlands: Sense Publishers.

Ruohotie-Lyhty, M., & Moate, J. (2016). Who and how? Preservice teachers as active agents developing professional identities. *Teaching and Teacher Education*, 55, 318-327.

Soini, T., Pietarinen, J., Toom, A., & Pyhältö, K. (2016). What contributes to first-year student teachers' sense of professional agency in the classroom?. *Teachers and Teaching: theory and practice*, 21(6), 641–659.