

MATHEMATICS TEACHER EDUCATORS AS A ROLE MODEL: THE PERSPECTIVE OF STUDENT TEACHERS

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Abstract

The aim of this study is to understand the mathematics teacher educators' role model from the student teacher perspective. For that, we inquired what prospective teachers look at and scrutinize when the mathematics teacher educator is teaching about teaching. Data was collected through focus group with forty-eight student teachers from three Chilean primary school pre-service teacher education programs. The focus group were analyzed using thematic analysis. Results showed that student teachers highlighted three main elements related to the mathematics teacher educators' role as models: (1) personal attributes expected from a teacher; (2) instructional practices carried out; (3) the experience of a congruent teaching approach. These findings have implications for both practice and research.

Introduction

Research on mathematics teacher education increasingly acknowledges that learning to teach is a complex process involving more than just the acquisition of mathematical content knowledge and general teaching skills during pre-service teacher education (Ball & Forzani, 2009). Consequently, learning to teach mathematics has become an extensive line of research in this field, focusing on the crucial role in this process of both mathematics teacher educators and student teachers (Ball & Even, 2009; Beswick & Goos, 2018).

The above is especially relevant considering that mathematics teacher educators play a key role as models for future school teachers: through their teaching practices, they have an impact on the student teachers' perspectives of teaching mathematics (Beswick & Goos, 2018; Castro Superfine & Li, 2014; Jaworski, 2008). Student teachers, in turn, are systematically exposed to modeling through the learning experiences that take place within teacher education programs. Therefore, for improving the quality of education, mathematics teacher educators are expected to model effective teaching practices to enhance learning so that their student teachers can replicate the same when they become school teachers (Bekele & Tacconi, 2018; Lunenberg, Korthagen, & Swennen, 2007).

However, modeling effective teaching practices do not itself ensure that student teachers can learn and apply such teaching practices in their own teaching (Loughran & Berry, 2005; Lunenberg et al., 2007; Moore & Bell, 2019). It is possible that, although mathematics teacher educators may believe they have developed opportunities to share their modeling practices, student teachers not necessarily perceive these opportunities as such. Therefore,

it is worth asking what student teachers experience and think when the teacher educators are teaching.

For achieving a better understanding of the interactive nature of modeling, the present study explores the mathematics teacher educators' role model from the student teacher perspective. We aimed to inquire what prospective teachers look at and scrutinize when the mathematics teacher educator is teaching. As they are experiencing the process of learning to teach mathematics, we believe their insights and point of views are valuable information for improving and align teaching and learning processes within teacher education programs.

Framework

Traditionally, modeling has been defined as a practice of intentionally displaying exemplary teaching practice with the aim of promoting professional learning in preservice teachers (Loughran, 2006; Lunenberg et al., 2007). Loughran (2006) argues that modeling allows student teachers to develop a deeper understanding of both how to use a specific teaching procedure and why to use it. Besides, he points out teacher educators need to ensure that the purpose in their teaching is clear and explicit for themselves and their students. Considering student teachers will not be able to master the pedagogical skills for teaching mathematics immediately, mathematics teacher educators must model their use systematically so that student teachers see and experience these skills in action (Aleccia, 2011).

Regarding the research on student teachers and their experience of learning to teach, a large number of studies have been conducted, which focus on aspects such as: perception of coherence within teacher education programs (Canrinus, Bergem, Klette, & Hammerness, 2017; Hogg & Yates, 2013); student teachers' conception of teaching (Cheng, Tang, & Cheng, 2016; Wood, 2000); the differences between first-year and fifth-year student teachers on their approaches to learning (Marušić, Jugović, & Lončarić, 2017); student teachers' pedagogical reasoning (Gravett, Beer, Odendaal-kroon, & Merseth, 2017; Nilsson, 2009); and the student teachers' perspective of the nature and role of theory in teacher education (Sjølie, 2014). These studies show that student teachers: value modeling practices enacted by teacher educators (Hogg & Yates, 2013); recognize the teacher educators who had influenced their conceptions of teaching (Cheng et al., 2016); and prefer to learn practical knowledge that can be applied in the classroom (Nilsson, 2009; Sjølie, 2014). Besides, final-year student teachers display more conscientiousness, self-efficacy for learning and performance than first-year student teachers (Marušić et al., 2017).

Method

This study adopted a qualitative research approach to understand the perspective of student teachers about the mathematics teacher educators' role model (Cohen, Manion, & Morrison, 2000). Participants were selected using purposive sampling (Moser & Korstjens, 2018), and the final sample comprised 48 student teachers (17 in first or second year, 17 in third or fourth year, and 14 in fifth year), belonging to three Chilean primary school pre-service teacher education programs. Participants were invited to take part voluntarily and signed a consent form. Characteristics of this sample are presented in Table 1.

Data were collected through focus group because this method facilitate dialogue and discussion among participants, contributing to the exchange of ideas formed within a social context (Kidd & Parshall, 2000). The focus group questions focused on the student teachers' experience of modeling and the teaching practices adopted by the mathematics teacher educators. All of the interviews were audio recorded and fully transcribed in preparation for analysis.

The data analysis started with a thematic analysis (Braun & Clarke, 2006) where data were read repeatedly in order to identify initial codes and recurring themes. The primary focus of analysis was the development of categories from the raw data into a framework that captured key themes and processes judged to be important by the researchers. During the data analysis process, two research team members cross-checked the coding of the responses and the categorizations and refined the set of codes as required. Consensus was achieved upon discussion of the coding and categorizing of the themes. The reliability of the data analysis was thus enhanced through this auditing process (Cohen et al., 2000).

Findings

Across all focus groups, we find that student teachers report similar views about the modeling practices enacted by mathematics teacher educators. For instance, several of them stressed that they pay attention to the teacher educator's approach to teaching for developing their own teaching style, as is described in the following quote:

New models, new references of how to be a teacher... to observe classes for a teacher who is just starting, I think it is like the best way we have to build our own teaching style (FG-5).

Student teachers highlighted three main elements related to the mathematics teacher educators' role as models: (1) personal attributes expected from a teacher; (2) instructional practices carried out; (3) the experience of a congruent teaching approach. Concerning the first element, the student teachers identified different characteristics in their mathematics teacher educators they think crucial for mathematics school teachers, such as in-depth knowledge of mathematics and being responsive to the needs of learners. That is, student teachers look and pay attention to the person of the teacher.

You can see that the mathematics teacher educator knows a lot. When I will become a teacher, I would like to know everything he knows to be able to teach it (FG-1).

I have learned what have been taught to us about mathematics, but also from the mathematics teacher educator herself, from the attitudes she has towards each one of us (FG-7).

Regarding the second element, many student teachers pointed out that they learned not only the content knowledge taught, but also different instructional practices that support the teaching and learning processes. For example, the organization and management of classroom teaching, eliciting student thinking, and monitoring student participation. In other words, student teachers analyze teacher educators' teaching practices.

I did not know that mathematics could be learned in this way. And today I realize that, just as she [the mathematics teacher educator] manages her classes, I can do it with my own students tomorrow (FG-4).

I feel that he [the mathematics teacher educator] even anticipated our heuristics, like our ways of thinking or tackling an exercise. He took our answers into account and knew how to use our reasoning to construct the content. I found that quite admirable (FG-5).

Other student teacher stressed how the mathematics teacher educator asked for further explanations for a better understanding of the topic discussed.

She is always encouraging you to question what you are doing, because when you give an answer she always asks, "but why is that so?" Then you are always like questioning yourself, and that gives you the opportunity to have new ideas (FG-7).

Finally, the third element student teachers pointed out is whether mathematics teacher educators enact a teaching approach in accordance with their discourse; that is, if they model and reflect the pedagogical theories they introduce. Therefore, student teachers focus on the experience of learning as a whole, including both the content taught and the teaching strategies performed.

It caught my attention that her class was very consistent from start to finish. That is, the activity we did made sense with the texts we were reading, but it also made sense the way she was doing it, and why and for what we had to learn that (FG-4).

In the same way, a student teacher emphasized her critical perspective concerning the approaches to teaching adopted by her mathematics teacher educators, scrutinizing their teaching practices and the pedagogical reasoning underlying.

I am studying for becoming a teacher, then it's like one becomes very critical, in terms of how the teacher educator does it, how he teaches me, whether he adapts or does not adapt [the content he teaches] (FG-2).

On the other hand, it is worth to notice that we found differences in depth between novice and senior student teachers' awareness of the mathematics teacher educators' modeling. Novice student teachers (first or second year) put more attention on general aspects of the teaching practice, such as the difficulty of teaching a certain topic or teaching practices they value.

Now I realize why it is so difficult for a teacher to teach Geometry ... why teaching such content is so complex (FG-1).

I really liked the participation. To answer the question, go to the board and see how many exercises can be solved in different ways (FG-2).

Conversely, senior student teachers (third to fifth year) were able to realize issues about their own learning and the pedagogical reasoning behind teaching practices enacted by the mathematics teacher educator, becoming more aware of different dilemmas of practice.

I feel that the activities proposed by the mathematics teacher educator broke our schemes. Because you also realize that sometimes you learn things a bit mechanically; and that there are things that you believe you already know, but do not know how to explain them (FG-7).

I would say that the fundamental thing is that: to be able to analyze and use more logic, and discover that behind all those things they [the mathematics teacher educators] taught us there is a why and a theory that sustains them (FG-9).

In summary, most of the student teachers were able to see mathematics teacher educators as teaching models from whom they learned various teaching practices that they would like to replicate in the school classroom. The above is especially remarkable, considering that all the teaching practices identified by the participants were not made explicit by the mathematics teacher educators.

Discussion

The present study aimed to inquire what prospective teachers look at and scrutinize when the mathematics teacher educator is teaching. This research found that student teachers examine aspects such as personal attributes of the mathematics teacher educators, their teaching practices performed, and whether they enact a congruent teaching approach. Moreover, the results suggest that final year student teachers developed more awareness in thinking the pedagogical reasoning underlying teaching practices displayed by their mathematics teacher educators, compared to novice student teachers. Novice student teachers focus their attention on developing practical knowledge for teaching. By contrast, senior student teachers look into the practice of mathematics teacher educators for learning about teaching and education in the broader sense. These findings are largely consistent with the results of similar studies related to student teachers' learning and positioning during teacher training (Loughran, 2006; Marušić et al., 2017; Nilsson, 2009).

Thinking about modeling from student teachers perspective implies new challenges for mathematics teacher education. First, learning about teaching mathematics should include collaborative work between teacher educators and student teachers that stress the experience of learning to teach comprehensively, considering both the mathematical content and the practice of mathematics in the task of teaching. Second, taking into account the influence of teacher educators' teaching in the experience of learning to teach in student teachers, it is crucial to move forward to explicit and purposiveness modeling. Finally, we recommend continuing the research on modeling from student teachers' perspective, as a tool for improving the experience of learning in mathematics teacher education.

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Table 1 Characteristics of the sample

Focus Group	Teacher Education Program	Year	Participants
1	A	First	5
2	A	First	5
3	B	Second	7
4	A	Third	5
5	B	Third	5
6	C	Third	7
7	B	Fourth	6
8	A	Fifth	4
9	A	Fifth	4