

“Education fish in a world full of sharks”: Preservice teachers’ experiences in mathematics content courses



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Abstract

Secondary mathematics preservice teachers (PSTs) are required to take a number of mathematics content courses to develop their mathematical content knowledge. In these spaces, they are in the minority amongst students in STEM programs. Using a series of semi-structured interviews, we explored the experiences of secondary mathematics PSTs in these courses. Our findings suggest that PSTs experience a range of challenges, including being ignored and dismissed by mathematics professors, and difficulties connecting with and understanding course content. To cope with these challenges, PSTs developed community with each other. PSTs also became reflective practitioners and considered how their experiences in these courses applied to their learning as future teachers.

Background

- Mathematical content knowledge is crucial for effective and thoughtful instruction in mathematics (Ball et al., 2008).
- University-level mathematics content courses are often the primary context where secondary mathematics preservice teachers (PSTs) develop their mathematics content knowledge.
- Many PSTs encounter major challenges in these courses, struggling to grasp the material and its relevance to teaching secondary mathematics (Goulding et al., 2003).

Research Question

What are the experiences of secondary mathematics PSTs taking university-level mathematics content courses?

Mathematics Content Courses

- **Scope and content:** PSTs take a variety of mathematics content courses across different domains of mathematics (e.g., calculus, geometry, statistics) and in complementary areas (e.g., computer science, philosophy of mathematics). Content extends beyond secondary level curricula.
- **Purpose:** For PSTs to explore and make connections across a breadth of mathematics domains, develop a “big picture” of mathematics, and foster self-confidence in their own mathematical abilities (Hodges et al., 2010).
- **Enrollment:** PSTs and students in other STEM programs (Dreher et al., 2016). PSTs are typically numerically in the minority.
- **Professors:** Mostly mathematicians who do not have a formal background in education (Leikin et al., 2018). At research-intensive institutions, professors primarily focus on their scholarship.
- **Delivery:** Typically teacher-centred (e.g., lecture), however, student-centred and active teaching approaches are now occurring more often (Reinholz, 2018).
- **Gap in the literature:** There is limited research investigating the experiences of PSTs engaging in these courses during their teacher education program.

Research Context and Method

- Exploratory case study (Yin, 2009) over the course of a four-year B.Ed. program at a large Canadian, research-based university.
- B.Ed. program comprised of field experiences and coursework (mathematics content, mathematics methods, and general education courses).
- **Participants:** One cohort of secondary mathematics PSTs ($n = 7$)
- **Data sources:** Two semi-structured interviews per year.
- **Data analysis:** NVivo12 facilitated iterative coding cycles using the constant comparative method (Kolb, 2012).

Findings

Challenges encountered by PSTs in mathematics content courses

- **Course material:** The mathematics content courses were the first time PSTs struggled as mathematics learners. Many PSTs failed courses or delayed other program components (e.g., field experiences) to complete content course requirements.
- **Professors:** PSTs shared that mathematics professors spoke down to them as education students. PSTs also critiqued the pedagogical approaches used by professors.
- **Outsider status:** PSTs felt inferior to their STEM classmates. PSTs felt like they did not belong in the mathematics content courses.

PSTs’ responses to experiences in mathematics content courses

- **Becoming reflective practitioners:** PSTs frequently considered what their professors were doing as mathematics educators. Unfortunately, from their professors, most PSTs confirmed what they “*don’t want to do...as a teacher*”. The challenges that PSTs faced in the mathematics content courses allowed PSTs to develop empathy for their future students.
- **Community development for survival:** PSTs leaned on each other for both mathematical and emotional support. PSTs organized study groups which also served as “*therapy sessions*”. PSTs formed a community to support one another through their difficult experiences. As stated by one PST, “*Us, education fish, have to stick together in a world full of sharks.*” Or, as another PST said, “*If we’re going to survive, we need to work together.*”

Conclusions

- Secondary mathematics PSTs faced challenges in their mathematics content courses, but were able to be productive in their struggle. PSTs used their experiences to consider how they wanted to be as future teachers (Zazkis & Leikin, 2010). A self-developed community helped PSTs complete their mathematics content courses and alleviate feelings of isolation (Grossman et al., 2001).
- Teacher education programs should facilitate ways of promoting community development for PSTs. Mathematics departments must develop an awareness of their student population and the impact that coursework and professors have on the success or failure of their students. Students from all programs will be better served if mathematics content courses can better consider students’ different goals and connect course material to students’ realities, and improve their teaching methods.

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