

## TWO PRESERVICE ELEMENTARY TEACHERS' PERCEPTIONS ABOUT THEIR LEARNING AND UNDERSTANDING OF FRACTIONS

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*This study investigated two preservice teachers' emergent perceptions about learning and understanding fractions while they engaged with and reflected on fraction-based children's thinking activities in a content course. Our findings show varying perceptions in regards to mathematical content and their own understanding of mathematics. These findings are due, in part, to the level of confidence the participants brought with them.*

This study investigated two preservice elementary teachers' perceptions about their learning and understanding of fractions, which emerged as they engaged with and reflected on fraction-based children's thinking activities in a content course. Due to the vast number of perceptions revealed, for this session we only focus on what perceptions emerged in regards to the interrelated themes of mathematical content and the preservice teachers' own understanding of mathematics. For our purposes, these perceptions were conceptualized as the result of applying individual prior knowledge, experiences, and beliefs to specific settings. These settings were comprised of individual assessments and group discussions within a content course and one-on-one interviews. We contend that a better insight into preservice teachers' perceptions is a critical tool for teacher educators to develop rich activities that promote continued mathematical growth.

Sociocultural theory (Vyotsky, 1978) framed our study. Learning was viewed as a function of environmental social interaction where knowledge was continually developed, shared, and transmitted. Focused discussions allowed the preservice teachers to form communities of practice (Lave & Wenger, 1991) in which they could extract meaning from children's explanations and share their developed knowledge with fellow classmates. By interacting with children's thinking in this way, we provided the preservice teachers an opportunity to re-think their mathematical identities (Franke & Kazemi, 2001) and to make mathematical discoveries of their own (Crespo, 2000).

Motivated by the literature on preservice teachers' knowledge of fractions (e.g. Ball, 1990; Tirosh, Fischbein, Graeber, & Wilson, 1998), three graduate students (the two researchers and an applied mathematician) developed a fraction-based module. This module was created as a part of the Center for Mathematics Education of Latinos/as (CEMELA)<sup>1</sup> and served as the children's thinking activities for this study since it centers on the written work and follow-up explanations of four 5<sup>th</sup>-graders. To document what perceptions emerged in this setting, two females in their junior year of coursework, Nora and Alisa<sup>2</sup>, were chosen to be cases. They were selected based on their expressed interest and their responses on a background profile and mathematical autobiography, specifically because of their differences in their perceived ability level and educational backgrounds. We focused on two case studies because we wanted to document not only what perceptions emerged but also to understand the source of these perceptions, since in our view perceptions are based on an individual's prior knowledge, experiences, and beliefs.

Data came from a variety of sources. Both a pre- and a post-assessment on the children's thinking activities were completed, with similar content questions asked on both and a self-evaluation portion added to the post-assessment. A background profile and mathematical autobiography were also collected, and all in-class discussions were video- and audio-taped.

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*Lamberg, T., & Wiest, L. R. (Eds.). (2007). Proceedings of the 29<sup>th</sup> annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Stateline (Lake Tahoe), NV: University of Nevada, Reno.*

All written work done during the activities was collected, and two individual interviews were conducted. The first interview took place prior to the start of the children's thinking activities, with the primary purpose of understanding the case study participants' backgrounds and their responses from the pre-assessment. The focus of the second interview, which took place after the children's thinking activities were completed, was on the case study participants' reflection on their experiences, as well as on their responses from the post-assessment.

Findings indicate that while both case study participants attended to their own mathematical understanding, they did so in very different ways. Alisa perceived the children's thinking activities as an opportunity in which she could take a step back and begin to understand the concepts more deeply. This perception was seen various times throughout the data. Alisa stated that prior to the children's thinking activities she was aware that one could interpret a fraction in different ways based on the context in which it was embedded. However, she perceived herself as not completely knowledgeable about these different fractional interpretations. As a result of her experiences within this setting, Alisa was able to become more cognizant of this lack of knowledge. Additionally, Alisa commented on how her understanding of equivalence of fractions had been strengthened. For example, she had never really considered different-sized objects when making fractional comparisons. She stated that, "... half of one jelly bean and half of a hundred jelly beans, you obviously have more, but it doesn't mean that the half is not equivalent." In other words, she was commenting on the power of understanding that  $\frac{1}{2} = \frac{50}{100}$ , although the size of the wholes is different.

On the other hand, Nora generally avoided discussing her understanding of mathematics and instead perceived this lack of content understanding as a result of incomplete explanations from her instructor: "... cause we asked him multiple times, like 'Is this what you mean?' and he never really completely explained exactly what he meant." The only time Nora directly commented on her mathematical understanding was when she addressed her difficulties with the children's thinking activities stating, "The videos just confused me and made me work very hard to keep the understanding that I had about fractions."

In regards to mathematical content, Alisa was very open about how the children's thinking activities altered her view of fractions. Specifically, Alisa commented on the meaning of fractions and the relationship she saw between whole numbers and fractions. She noted that it was important to see a fraction as not just separate whole numbers but as part of a larger class of numbers in which there is a connection between pieces and wholes. She perceived whole numbers and fractions to be similar in certain aspects, but that fractions "are a whole set of new numbers on the number line ... they have their own unique way of doing things." In contrast, Nora never openly attended to the mathematics content present in the children's thinking activities, even though there were numerous opportunities to do so.

While both case study participants saw themselves as mathematically capable, Alisa was more willing to share her view of mathematics than Nora. While there may be many reasons for this openness, it is our contention that the level of mathematical confidence the case study participants brought with them was a major factor. Alisa's perception was that she was very strong mathematically, which she associated to her family background and her prior academic achievements. This perceived strength is supported by the leadership role Alisa took within her group discussions and the deep level of self-reflection she provided on both her self-evaluation and in the interviews. Nora, on the other hand, noted her lack of confidence in understanding fractions, attributing it to her non-use of them in her everyday life. In the classroom, she remained very quiet and assumed a docile role within the group environment. Her reflections were mainly focused on her perceptions of the students and their

thinking, and how mathematics, in her view, should be taught. It appears that her insecurity with fractions limited her vocalization of her mathematical experience, both in terms of her own understandings and her conception of mathematics.

With this study we are contributing to the research on the psychological factors that are associated with how preservice teachers learn and understand fractions. Specifically, our findings inform teacher educators of different factors to consider when developing teacher education content coursework, in particular the preservice teachers' level of mathematical confidence. Additionally, while prior research has shown the benefit of using children's thinking as a method to develop both preservice teachers' content and pedagogical content knowledge (e.g. Crespo, 2000; Tirosh, 2000), this study demonstrates that it can also be used as a setting for comprehending preservice teachers' perceptions. This knowledge aids teacher educators in determining the view of mathematical content and understanding of mathematics that preservice teachers possess. Understanding perceptions about mathematical content is vital because it can illustrate what misconceptions preservice teachers may have. Knowledge of the perceptions that preservice teachers have in regards to their own understanding of mathematics is essential so that teacher educators can develop instructional strategies and settings that support preservice teachers' continued mathematical growth.

### Endnotes

1. CEMELA is a Center for Learning and Teaching and is funded by the National Science Foundation under grant ESI-0424983. The views expressed here are those of the authors and do not necessarily reflect the views of the funding agency.

2. Both preservice teachers' names are pseudonyms.

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