CENTERING STUDENTS' ASSETS IN EARLY ELEMENTARY MATHEMATICS: TEACHERS' BELIEFS ABOUT MATHEMATICS, LANGUAGE, AND EMERGENT BILINGUALS

Brittany Caldwell
Vanderbilt University
Brittany.Caldwell@Vanderbilt.Edu

This study explored early grades teachers' professed beliefs about mathematics, language, and Emergent Bilinguals (EBs). The research question was: what are early grades teachers' professed beliefs about mathematics, language, student thinking, students' out-of-school experiences, and students' home and everyday language practices, in particular for EBs? The teachers in this study displayed varying degrees of asset-based responses (74%-100%) to the survey and discussed beliefs related to 1) students' backgrounds and experiences, 2) students' everyday and home languages, 3) mathematics vocabulary, and 4) supporting EBs. During interviews, teachers described their beliefs about students' assets (experiences and home/everyday language) in ways that aligned with 1) allowing students' assets in the classroom or 2) drawing on students' assets to support mathematics learning.

Keywords: Teacher Beliefs, Equity, Inclusion and Diversity, Elementary School Education

Many factors impact how teachers orchestrate their mathematics instruction. One factor that has been the focus of many studies in mathematics education is teachers' beliefs (e.g., Lee & Ginsburg, 2007; Raymond, 1997; Roesken-Winter, 2013; Staub & Stern, 2002; Stipek et al., 2001). Beliefs can impact teaching practice (Schoenfeld, 2002; Raymond, 1997), shaping the ways teachers facilitate mathematics instruction in early grades.

Teachers' beliefs about language and language learning can impact EBs' opportunities to participate in mathematics instruction. There are beliefs that may be unproductive for supporting the needs of EBs in the mathematics classroom. For example, a belief that mathematics should be taught by an English as a Second Language/ English Language Development (ESL/ELD) teacher may reflect a view that children need to learn English before they can participate in mathematics. This could also lead to placing a student in an ESL/ELD class with a teacher unprepared to teach mathematics. There is specific content and pedagogical content knowledge related to teaching mathematics. These may not be present from teachers with little training in mathematics and in a classroom where the main and often the only focus is teaching English.

Fernandes (2020) highlights a need for more research to look at teachers' beliefs about language and mathematics instruction with EBs. Given the need, I analyzed early grades teachers' beliefs about mathematics, language, and students' assets. I explored the research question: what are early grades teachers' professed beliefs about mathematics, language, student thinking, students' out-of-school experiences, and students' home and everyday language practices, in particular for EBs?

Literature Review

Teachers' beliefs are shaped by the setting and context where they teach. Lee and Ginsburg (2007) found that teachers in middle-socioeconomic status (SES) preschools were more likely to support activities relevant to the students' interests and were more focused on the social aspect

rather than the academic aspect, of preschool. In these schools, teachers viewed their students as coming from homes with educational resources that prepared them for school. In comparison, teachers serving low-SES preschools were more likely to highlight the importance of academics and direct instruction in preschool. Aligned with deficit views, the teachers from low-SES preschools positioned their students as coming from disadvantaged homes and needing to catch up. This distinction is crucial for EBs in poor schools as they may not have opportunities to draw on their full set of resources to learn mathematics if their teachers hold deficit views of them. Teachers' deficit views of students can limit students' access to quality mathematics instruction and opportunities to learn mathematics with understanding (Lee & Ginsburg, 2007; Turner et al., 2012). Instead, teachers need to hold asset-based views of their students, including EBs, to fully support their mathematics learning. Research has highlighted the importance of 1) drawing on EBs' experiences and backgrounds to provide access to content (e.g. Aguirre et al., 2012; Turner et al., 2012), 2) leveraging students' home and everyday language to support student learning (e.g., Brenner, 1998; de Araju et al., 2018; Turner & Celedón-Pattichis, 2011; Moschkovich, 2013), and 3) teaching vocabulary as connected to concepts and not isolated (Moschkovich, 2013, Moschkovich, 2015a). When teachers hold beliefs that align with these recommendations, they have asset-based views of their students and may become more likely to provide opportunities for mathematics and language learning in the classroom.

Fernandes (2020) found that pre-service teachers' beliefs about the use of home languages in the classroom fell into one of four categories along a continuum that reflect beliefs about native language use in mathematics classrooms: no native language, limited use of native language, extensive use of native language, and bilingualism. In his study, two out of 31 participants were characterized as having beliefs related to no native language use in the classroom, whereas nearly half (n=15) were characterized as limited native language use (Fernandes, 2020). These two categories were highlighted to show an expansion of previous work (Ruiz, 1984) highlighting teachers' beliefs that focus on a deficit view (i.e., language as a problem) of students' native language. In contrast, participants who identified language as a resource shared beliefs related to extensive use of native language in the classroom (n=10) and bilingual use in the classroom (n=3) (Fernandes, 2020). The teachers' beliefs that were documented in this study were complex and included mixed views of students' native language use in the mathematics classroom.

Framework

In this study I looked at beliefs through the lens of Multiple Mathematical Knowledge Bases (MMKB) (Aguirre et al., 2012; Turner et al., 2012), and the language orientations construct (Fernandes, 2020). I drew on Philipp (2007) to define beliefs as "psychologically held understandings, premises, or propositions about the world that are thought to be true [...] as dispositions toward action" (p. 259).

The primary purpose of this study was to look at teachers' beliefs about language and mathematics for EBs. Therefore, I used the language orientations construct (Fernandes, 2020) with the associated MEELS instrument (Fernandes & McLeman, 2012) to design the data collection protocols and to look at the data. For the study's design, I adapted MEELS to develop a survey and inform the interview questions that I used for data collection. I used MEELS to include items related to native language use in the mathematics classroom, fairness of supporting EBS, and teaching strategies for EBs. The language orientations framework (Fernandes, 2020) was the primary lens I used to look at teachers' responses. This framework includes four orientations that range from viewing language as a problem to viewing language as a resource.

On the farthest side of the continuum where language is viewed as a problem, Fernandes (2020) highlighted pre-service teachers' orientations that reflected "no native language." In this group, the teachers felt there was no room for native language in a mathematics classroom. Next, pre-service teachers with a "limited use of native language" believed that it was acceptable for students to use their native language in some situations, but the goal was to replace their language with English in the mathematics classroom. Moving towards views of language as a resource, Fernandes (2020) found that some pre-service teachers held beliefs that reflected "extensive use of native language" where teachers supported any language use in the classroom and the goal was to learn mathematics regardless of language. The final group had beliefs that reflected and promoted "bilingualism," where the pre-service teacher promoted native language use because they believed that native languages support mathematics learning. While Fernandes (2020) only included native language in these constructs, I expanded this work to include everyday communication. This is because many researchers (e.g., Au & Kawakami, 1985; Brenner, 1998; de Araujo et al., 2018; Gutiérrez, Baquedano-López & Tejeda, 1999; Turner & Celedón-Pattichis, 2011) have found that inviting all of students' linguistic resources into the classroom, including native language and language practices (e.g., talk story, joking, storytelling, dialects), supports engagement and learning.

In addition to teachers' beliefs about language and mathematics, I also included opportunities for teachers to share their thoughts about students' experiences and interests related to mathematics outside of the classroom. MMKB includes students' "multiple understandings and experiences that have the potential to shape and support students' mathematics learning" (Turner et al., 2016, p. 49). One key feature of MMKB is students' interests and experiences outside of the classrooms, so I intentionally asked questions and included statements about this in my data collection protocols.

Methodology

This is a qualitative study where I used the frameworks of MMKB (Aguirre et al., 2012; Turner, et al., 2012) and language orientations (Fernandes, 2020) to design the study and analyze the data. Data for this study came from survey and interview responses from a group of experienced early grades teachers. My analysis of these responses drew on descriptive statistics and interpretive analysis. I focused on the teachers' words and their responses to statements and questions. One guiding assumption I have about the teachers in this study is that these teachers are professionals who navigate many things that can impact their instruction that may or may not align with their beliefs about mathematics instruction with EBs. I intentionally did not count or run statistical analyses on the data because of the small sample size (n=20) and because I purposefully selected these teachers in a fashion that made them not representative of the larger teaching force (e.g., in terms of years of teaching, experiences with professional development).

Participants

I recruited participants using convenience sampling from sources including mutual colleagues, individuals I knew, and a well-established social media platform. During recruitment, I identified specific criteria for eligibility. This included teaching for at least 5 years in an early grades classroom (Pre-K through 3rd grade) and current placement in an early grades classroom. I also told the teachers that the study was about mathematics and language. In mathematics education research, there are a plethora of studies done with pre-service teachers (e.g., Ambrose, 2004; Turner et al., 2016). Therefore, I intentionally selected experienced

teachers (five or more years of teaching) to explore their beliefs and practices. Recruitment occurred during the 2020-2021 school year.

All twenty teachers responded to a survey online through google forms. Of these 20 participants, four participants were preschool teachers, three were kindergarten teachers, five were first grade teachers, one was the distance/online teacher for third grade, one teacher had a kindergarten-first grade combination class, and the remaining six did not identify their current grade as this was a question I added after some of the teachers had already filled out the survey. Given the eligibility criteria, all teachers had been teaching for over five years, ranging between 5 and 36 years. While most teachers reported being monolingual, six reported speaking and understanding Spanish and English, three reported speaking and understanding French and English, one reported familiarity with Mandarin, and one reported "other". Half of the participants reported being monolingual and the other half reported being multilingual.

Related to the students' demographics, the teachers reported on their students' EL[5] designation and family background to the best of their knowledge. While four teachers reported having no designated ELs in their class, others taught classes of only ELs. Of the 20 teachers, 16 of them had at least one EL in their class during the 2020-2021 school year.

Data Collection

There were two sources of data for this study that came from survey and interview responses. For the survey, I recruited 20 teachers as participants. The items on the survey included demographic information (e.g., years of teaching experience, professional development, student information and statements about mathematics, student learning, teaching, the role of language in learning math, and emergent bilinguals. Teachers responded using a 5-point Likert scale ranging from strongly agree to strongly disagree. Some survey items were adapted from MEELS (Fernandes & McLeman, 2012). MEELS was used by Fernandes (2020) as a data collection tool as he developed the language orientations framework. Fernandes (2020) used MEELS to identify pre-service teachers' beliefs about mathematics and language instruction with EBs (Fernandes, 2020).

From the participant group of 20, five agreed to be interviewed after taking the survey. Therefore, I interviewed these five teachers using a semi-structured interview. The five participants self-selected to participate in the interview and were not selected to be representative of the larger sample. Questions on the interview asked teachers to reflect on their mathematics teaching, students learning, views of the role of language in learning mathematics, and supporting emergent bilinguals.

Data Analysis

I first coded the responses to analyze the survey as aligning with an asset-based view. I used previous research to identify if agreement or disagreement with each statement reflected an asset-based view. In particular, I drew on the recommendations from research related to 1) students' experiences and backgrounds (e.g., Aguirre et al., 2012; Turner et al., 2012), 2) students' home and everyday language (e.g., Brenner, 1998; de Araujo et al., 2018; Turner & Celedón-Pattichis, 2011; Moschkovich, 2013; Moschkovich, 2015a), and 3) teaching

[5] In the survey Emergent Bilinguals (EBs) were referred to as "ELs" to remain consistent with terms that the teachers were familiar with. I mirror this language when I share the responses to align more closely with the teachers' responses. However, I use the term Emergent Bilinguals (EBs) throughout the rest of the paper to highlight an alternative term that frames young multilingual learners using an asset-based view and shifts away from the English-dominant way of labeling.

mathematics vocabulary (Moschkovich, 2013, Moschkovich, 2015a). After I determined if agreement or disagreement revealed an asset-based view for each statement, I coded each participants' response as aligning or not aligning to an asset-based view. I then calculated the percentage of asset-based responses for each participant. For this calculation, I only looked at non-neutral responses (responses that fell on either side of neutral) and divided the number of asset-aligning responses by the total number of non-neutral.

To further examine the results of the survey, I analyzed participants' answers to the interview questions. I went through each interview from beginning to end and transcribed each section related to beliefs about students' experiences, language, supporting EBs, and mathematics vocabulary. I then summarized teachers' responses and quotes using descriptive codes. I looked across the participants to identify themes and the details of how these five teachers talked about their beliefs related to mathematics, students' experiences, language, and supporting EBs. Since I only interviewed five of the 20 teachers, these descriptions are not reflective of my entire participant group and cannot be generalized to other groups. However, these descriptions offer detailed ways in which these five teachers described students' assets related to mathematics and can provide insights into the beliefs that impact instruction for EBs

Teachers' Beliefs

The teachers responded with at least 74% of their non-neutral responses in ways that reflect an asset-based view. Beyond what I found in the survey responses, the interviews with five of the 20 teachers clarified and provided more detailed descriptions of their beliefs particularly related to supporting EBs' mathematics learning. From the interviews, I found that teachers held beliefs about students' assets and teaching mathematics with EBs related to students' everyday and home language, students' backgrounds and experiences, mathematics vocabulary, and supporting EBs.

In this study of teachers' beliefs, I found that teachers held varying degrees of asset-based views of their EBs and described beliefs specific to students' backgrounds and experiences, students' everyday and home languages, mathematics vocabulary, and supporting EBs. In this section, I synthesize these findings and highlight how these teachers described their beliefs related to using students' assets in mathematics instruction in two ways: 1) allowing students' assets in the classroom and 2) drawing on students' assets for mathematics learning.

I developed these two categories in part from the MMKB framework. The MMKB framework (Aguiree et al., 2012; Turner et al., 2012; Turner et al., 2016) identified how pre-service teachers talked about using students' thinking and experiences in their lesson plans. My first category, allowing students assets in the classroom, is in part related to the "initial practices" category of the MMKB framework. The teachers in my study talked about using students' experiences as context for mathematics problems and that students could use home and everyday language to demonstrate that they understood mathematics. These beliefs acknowledge that students' experiences and language are valuable and important but not necessarily a central part of learning mathematics. My second category, drawing on students' assets for mathematics learning, in many ways reflects the "meaningful connections" and "incorporating" categories from the MMKB framework. This category more closely aligns with beliefs that math and language practices should be used to support mathematics learning that reflects what students do in their homes and communities.

Allowing Students' Assets in the Classroom

Consistently across the five teachers who were interviewed, descriptions about students' assets revealed that they all allowed students' assets in the classroom. For example, they all discussed ways that they would allow students to demonstrate their understanding or share an answer using any way they could. All the teachers also talked about using students' backgrounds and experiences as context for mathematics problems. Two of the five teachers did not provide explicit details of using the mathematical practices from the students' lives or drawing on students' linguistic resources to support learning. One teacher talked about using students' names, and another said that their students probably used technology in their homes. Previous work has characterized ways various types of everyday mathematical practices can be used in mathematics instruction including using context that is 1) based on assumptions, 2) reflects layering or mathematizing, or 3) uncovering mathematical activities (Aguirre et al., 2012; Turner et al., 2012). Some of the ways these teachers talked about contextualizing problems reflected surface-level uses of information, some of which were likely based on assumptions about students rather than informed by information that was gathered from them. While these teachers talked about students using their assets in the classroom, three of the five teachers had no clear connections to content or learning. These responses in some ways reflect asset-based views of their students and can potentially act as an entry point for teachers to incorporate students' assets into mathematics instruction more fully. For example, acknowledging that eliciting and attending to students' experiences outside of the classroom is a part of leveraging students' experiences in meaningful ways. Eliciting and attending to may act as an entry point for teachers to start to make these meaningful connections (Turner et al., 2012; Turner et al., 2016).

Drawing on Students' Assets for Mathematics Learning

Three of the five teachers (Ms. G, Ms. L, and Ms. C) discussed drawing on students' assets for learning mathematics and mathematics vocabulary beyond just allowing students' assets in the classroom. Related to students' backgrounds and experiences, Ms. G and Ms. L made clear connections to the student's home life as they talked specifically about the mathematical practices from students' homes (measurement in building and keeping track of score in bowling) and highlighted ways they used these practices in instruction (a unit on measurement and during discussions). When teachers identify the mathematics that students use at home, such as keeping track of allowance or keeping score in bowling, and use this information during instruction, they connect to ways students use mathematics outside of school (Turner et al., 2016). Ms. G and Ms. L made connections to mathematical practices that their students saw or used at home and talked about how they brought these practices into their instruction. This aligns with the third category of using MMKB, uncovering mathematical activities. For EBs, this approach to teaching mathematics can broaden access to mathematical content by making it familiar and positioning student' activities from their homes as a valuable resource for learning.

Regarding students' home and everyday language, Ms. G and Ms. C talked about how they encouraged students to learn mathematics content and vocabulary by drawing on students' linguistic resources. Both teachers talked about the practice of revoicing to support students as they learned "math words" (Ms. C) and "academic language" (Ms. G). Revoicing is one effective approach to supporting students' mathematics learning (de Araujo et al., 2018; Moschkovich, 2015b) as it provides opportunities for students to hear and use more precise mathematical language and can support participation in mathematical discussions (Moschkovich, 2015b) . When EBs have access to all their linguistic resources in the classroom, they have more

opportunities to make meaning for mathematics content and language. In one study comparing two groups, the students from classrooms where home languages were accepted and encouraged outperformed students in classrooms where home languages were not accessible for classroom learning (Turner & Celedón-Pattichis, 2011). The importance of EBs having access to all their linguistic resources is frequently documented in the literature for student success (e.g., Brenner, 1998; de Araujo et al., 2018; Turner & Celedón-Pattichis, 2011; Moschkovich, 2013; Moschkovich, 2015a).

Conclusion

This study explored early grades teachers' professed beliefs about mathematics, student thinking, and students' early, out of school experiences with mathematics, particularly for EBs. The teachers in this study displayed varying degrees of asset-based responses (74%-100%) to the survey and discussed beliefs related to 1) students' backgrounds and experiences, 2) students everyday and home languages, 3) mathematics vocabulary, and 4) supporting EBs. During the interviews, teachers described their beliefs about students' assets (experiences and home/everyday language) in ways that aligned with either allowing students' assets in the classroom or drawing on students' assets to support mathematics learning.

This study corroborates and extends previous research (e.g., Fernandes, 2020; Turner et al., 2016). The research on teachers' use of students' MMKB (Aguirre et al., 2012; Turner et al., 2012; Turner et al., 2016) has highlighted characteristics of drawing on MMKB (students' thinking and mathematical experiences outside of school). The existing research on MMKB primarily focuses on how MMKB is integrated into instruction (Aguirre et al., 2012; Turner et al., 2012; Turner et al., 2016) and ways that curriculum creates "spaces" to draw on students MMKB (Land et al., 2018). This study adds to that research by providing examples of how teachers talk about using students' linguistic resources in addition to their experiences outside of school.

The findings specific to teachers' descriptions of allowing or drawing on students' home and everyday languages in the classroom (to demonstrate understanding or as a resource to make meaning) corroborates other findings related to teachers' beliefs. Like Fernandes' (2020) findings, most of his participants fit within the two middle categories, which reflected a combination of seeing students' language as a problem and seeing it as a resource. In my sample, 85% of the participants fit within these "blended" categories which is similar to his finding of 80% of his participants holding views with blended beliefs. In my sample and in the sample from Fernandes (2020) 15% of the teachers demonstrated views that align with a bilingual orientation. As discussed in the "drawing on students' assets for mathematics learning" category in this analysis, the teachers in this group discussed using the experiences and language of students to support mathematics content and language. The teachers who talked about students using their home language to make meaning for mathematics and for "math talk" or "academic language" also expressed beliefs that all linguistic resources should be used to learn. My findings corroborate the work by Fernandes (2020) in that the teachers' beliefs discussed in this chapter also fall within a continuum in the ways they view students' language in a mathematics classroom.

Differing from his study, I did not have any teachers that responded in ways that reflected a "no native language" orientation. Fernandes (2020) conducted his study with pre-service teachers. My study extends this work as it was done with veteran teachers. This analysis also extends the previous work as it looks at teachers' beliefs about assets more generally.

References

Aguirre, J. M., Turner, E. E., Bartell, T. G., Kalinec-craig, C., Foote, M. Q., McDuffie, A. R., Drake, C. (2012) Making connections in practice: How prospective elementary teachers connect to children's mathematical thinking and community Funds of Knowledge in mathematics instruction. *Journal of Teacher Education, 64(2),* 178-192.

Ambrose, R. (2004). Initiating change in prospective elementary school teachers' orientations to mathematics teaching by building on beliefs. *Journal of Mathematics Teacher Education, 7*, 91–119

Au, K. H. & Kawakami, A. J. (1985) Research Currents: Talk story and learning to read. *Language Arts, 62*(4). 406-411.

Brenner, M. E. (1998) Adding cognition to the formula for culturally relevant instruction in mathematics. *Anthropology and Education Quarterly, 29(2)* 214-244.

de Araujo, Z., Roberts, S. A., Willey, C., & Zahner, W. (2018) English learners in K-12 mathematics education: a review of the literature. *Review of Educational Research. 88(6)*. 879-919.

Fernandes, A. (2020) The language orientations of future mathematics teachers in the United States. *Journal of Research in Mathematics Education. 9*(1), 7-29. doi: 10.17583/redimat.2020.4297

Fernandes, A., & McLeman, L., (2012). Developing the mathematics education of English learners scale (MEELS). In L. R. Van Zoest, J- J. Lo, & J. L. Kratky (Eds.), Proceedings of the Thirty Fourth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (p. 591-597). Kalamazoo, MI: Western Michigan University.

Gutiérrez, K. D., Baquedano-López, P., & Tejeda,C., (1999) Rethinking diversity: Hybridity and hybrid language practices in the third space. *Mind, Culture, and Activity. 6*(4), 286-303. doi: https://doi.org/10.1080/10749039909524733

Lee, J. S. & Ginsburg, H. P. (2007). Preschool teachers' beliefs about appropriate early literacy and mathematics education for low- and middle-socioeconomic status children. *Early Education and Development, 18*(1). 111- 143, doi: 10.1080/10409280701274758

Moschkovich, J. (2013) Principles and guidelines for equitable mathematics teaching practices and materials for English language learners. *Journal of Urban Mathematics Education. 6(1).* 45-57.

Moschkovich, J.N. (2015a) Academic literacy in mathematics for English Learners. *The Journal of Mathematical Behavior*, http://dx.doi.org/10.1016/j.jmathb.2015.01.005

Moschkovich, J. (2015b) Scaffolding student participation in mathematical practices. *ZDM Mathematics Education. 47(7)*, 1067-1078. doi: 10.1007/s11858-015-0730-3

Philipp. R. A. (2007). Mathematics teachers' beliefs and affect. In F. K. Lester (Ed.), *Second Handbook of Research on Mathematics Teaching and Learning: A project of the national council of teachers of mathematics.* (pp. 257-318). Charlotte, NC: Information Age Publishing.

Raymond, A. M. (1997). Inconsistency between a beginning elementary school teacher's mathematics beliefs and teaching practice. *The Journal of Research in Mathematics Education, 28*(5), 500-576. doi: https://doi.org/10.5951/jresematheduc.28.5.0550

Roesken-Winter, B. (2013) 11. Capturing mathematics teachers' professional development in terms of beliefs. In Li, Y. & Moschkovich, J. N. (Eds), *Proficiency and Beliefs in Learning and Teaching Mathematics: Learning from Alan Schoenfeld and Günter Törner.* (157-177). Rotterdam, The Netherlands: Sense Publishing.

Ruiz, R. (1984). Orientations in Language Planning. *NAEB Journal. 8*(2), 15-34.

Staub, F. C. & Stern, E. (2002) The Nature of Teachers' Pedagogical Content Beliefs Matters for Students' Achievement gains: Quasi-Experimental Evidence from elementary mathematics. *Journal of Educational Psychology*. 94(2), 344-355. doi: 10.1037//0022- 0663.94.2.344.

Stipek, D. J., Givvin, K. B., Salmon, J. M., & MacGyvers, V. L. (2001). Teachers' beliefs and practices related to mathematics instruction. *Teaching and teacher education*, *17*(2), 213- 226.

Turner, E., & Celedón-Pattichis, S. (2011). Mathematical problem solving among Latina/o kindergartners: An analysis of opportunities to learn. *Journal of Latinos and Education, 10*(2), 146-169.

Turner, E. E., Drake, C., Roth McDuffie, A., Aguirre, J. M., Bartell, T. G., & Foote, M. Q. (2012). Promoting equity in mathematics teacher preparation: A framework for advancing teacher learning of children's multiple mathematics knowledge bases. *Journal of Mathematics Teacher Education, 15*(1), 67–82.

Turner, E. E., Foote, M.Q, Stoehr, K. J, McDuffie, A. R., Aguirre, J. M, Bartell, T, G, & Drake, C. (2016) Learning to leverage children's multiple mathematical knowledge bases in mathematics instruction. *Journal of Urban Mathematics Education. 9(1),* 48-78.