Prospective Elementary Teachers' Experiences with and Perspectives on Grouping by Ability in Mathematics

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Within-class ability grouping (WCAG) is widely used in elementary mathematics instruction in the United States, yet it has drawn criticism on the grounds that it can inequitably limit the learning opportunities of some students, not least because of its connection to between-class ability grouping (BCAG) that is more common in middle or secondary schooling. Meanwhile, some high achieving countries use relatively little ability grouping in elementary school in comparison to the United States. In this paper, we draw on qualitative data from a series of assignments in four sections of an elementary mathematics methods course in the beginning teacher education programme at a United States university. These assignments were designed to explore the potential of using preservice teachers' (PSTs') memories of and experiences with ability grouping in their own schooling to support critical reflection about the possible negative consequences of within-class ability grouping practices. We found that while many PSTs reported negative personal experiences with ability grouping in mathematics, they often remained uncritical when reflecting on the use of ability grouping in the elementary classes they visited as part of their teacher education programme.

Keywords preservice teachers · ability grouping · equity field · experiences

Introduction

One of the persistent challenges to equitable teaching in mathematics is the separation of students into learning groups based on ability (Boaler, 2008; Oakes, 2005). In the United States, such grouping often starts in the elementary school, typically within classes, which we describe as "within-class ability grouping" or WCAG (Loveless, 2013). In middle and secondary grades, ability grouping tends to occur more at the class level, which we will denote as "between-class ability grouping," or BCAG[1]. Critics argue that ability grouping in general can exacerbate existing inequities (e.g., Bannister, 2016) because it "will inevitably separate students by characteristics that are correlated statistically with measures of ability, including race, ethnicity, native language, and class" (Loveless, 2013, p. 15). Mixed-ability groupings, on the other hand, can be taught in ways

[1] BCAG is alternatively referred to as "streaming," "setting," or "tracking." In this paper, when referencing prior research or data from our participants, we use the term used by the source. Otherwise, we use BCAG

that show improvements for lower achieving students without lowering gains for higher achieving students (Boaler & Staples, 2008; Linchevski & Kutscher, 1998).

Ability grouping is being increasingly scrutinized amid calls for attention to equity in mathematics instruction and teacher education (Aguirre, Mayfield-Ingram, & Martin, 2013; Association of Mathematics Teacher Educators, 2017). But preservice teachers (PSTs), as novices, are often not ready to enact equitable instruction (Sleeter, 2001), particularly if it requires challenging the status quo (Herbel-Eisenmann et al., 2013). They can struggle to reconcile the images of equitable instruction promoted in their education programmes with the realities of the practices they see enacted in schools (Neumayer-Depiper, 2013). Mathematics educators are starting to share their strategies for supporting attention to equity in teacher education courses (White, Crespo, & Civil, 2016), but, as Goffney and Crespo (2016) acknowledge, "Infusing a focus on educational equity adds yet another layer of complexity to an already challenging course to teach for mathematics teacher educators" (p. 8).

With regard to ability grouping, novices visiting elementary schools are likely to see WCAG enacted as a normative, unproblematic practice, perhaps portrayed even as a helpful way to support the learning of a range of students. At the same time, many PSTs describe negative feelings about mathematics as being grounded in their own experiences as mathematics students, including, notably, their experiences with ability grouping (Stoehr, 2017; Welder & Champion, 2011). These contrasting ideas about ability grouping represent an instance of potential cognitive conflict: PSTs' memories of ability grouping in their own mathematics learning experiences (often negative) juxtaposed against the WCAG practices they observed in their field assignments (often seen as positive). Such conflicts can be used to support changes in perspectives by surfacing one set of beliefs and prompting learners to view those beliefs in light of evidence or other new experiences (Shilling-Traina & Stylianides, 2013).

In this article, we report on such an effort in the context of teacher education, in which we designed assignments to elicit PSTs' memories of their experiences with ability grouping, drawing on evidence that PSTs' mathematics anxiety may be linked to such experiences (Welder & Champion, 2011). We conjectured that by encouraging a contrast between past experiences and observed ability grouping practices, PSTs might begin to question whether these practices served the best interests of students (Neumayer-Depiper, 2013). In this paper we focus primarily on how PSTs described their experiences with ability grouping and the relationships between these experiences and their perspectives on the WCAG they observed in their field placements. These findings have the potential to help teacher educators consider ways that PSTs' experiences with ability grouping might be leveraged to promote critical awareness of WCAG practices in elementary classrooms and to raise awareness of potential limitations to this approach.

Literature Review

Ability Grouping in Mathematics

The use of WCAG in elementary classes is rising in the United States, with an increase from 42% to 61% of teachers between 2003 and 2011 (Loveless, 2013). One explanation for the increase is that accountability systems (testing and teacher evaluation programmes) introduced in the 2000s provided incentives for WCAG, often justified as a method of "differentiation" (Loveless, 2013, p. 20). Differentiation involves assessing students' needs and working to provide all students with

access to valued content, while ability grouping often does the opposite; limiting access for certain groups of students and allowing adults' expectations to determine learning opportunities for students (Aguirre et al., 2013). These differences in access to learning opportunities are further exacerbated in middle and secondary schools, where BCAG is more prevalent. In Australia, for example, teachers report BCAG practices (often referred to as "streaming" or "tracking") in their schools beginning at grades 7 (37%) and increasing to 78% by year 10 (Forgasz, 2010), and 98% of secondary principals report some form of BCAG at their schools (Johnston & Wildy, 2016). The forms of BCAG, in terms of the number of streams, how students are assigned, and whether groups shift during the year, vary significantly from school to school (Forgasz, 2010). One approach that appears more palatable than full scale streaming in Australian primary schools is "regrouping," where students are separated into leveled classes only for particular subjects like English and mathematics (Gallagher, Smith, & Merrotsy, 2011; Macqueen, 2013).

In the United States, economic disparities and a highly localized system of school funding play a large role in establishing opportunities to learn, creating inequities that are often reproduced and sustained by BCAG systems (LeTendre, Hofer, & Shimizu, 2003; Oakes, 2005). This means that, in practice, a student's placement in a track is likely not to be determined solely by mathematical ability but also influenced by societal and economic factors. This appears similar to tracking in Great Britain, where studies show that working-class students and ethnic minorities are more likely to be placed in lower tracks than middle-class students who have the same test results, and that students from middle-class backgrounds more likely to be assigned to higher tracks, irrespective of their prior attainment (Archer et al., 2018; Francis, Archer, et al., 2017; Mujis & Dunne, 2010).

Ability Grouping and Equity

The theoretical basis for the critique of ability grouping is rooted in the concept of *opportunity to learn* (Boaler & Staples, 2008; Hiebert & Grouws, 2007). As Hiebert and Grouws (2007) explain,

> The emphasis teachers place on different learning goals and different topics, the expectations for learning that they set, the time they allocate for particular topics, the kinds of tasks they pose, the kinds of questions they ask and responses they accept, the nature of the discussions they lead—all are part of teaching and all influence the opportunities students have to learn. (p. 379)

When teachers use ability grouping, there is room for variation in the quality of opportunities to learn based on which group or class a student is in (Dunne et al., 2011; Gamoran, 1992; Ireson, Hallam, & Hurley, 2007; Zevenbergen, 2005). For example, if teachers give different quality tasks to different groups or engage one group in rich discourse while funneling other groups to correct answers or strategies, inequities in learning opportunities may be created. Such differences have been reported in Australia, not only in tracked secondary classes (Forgasz, 2010) but also among primary teachers in "regrouped" classes (Macqueen, 2010, 2012, 2013), where low-level classes were provided direct instruction and memorisation tasks and high level-classes were provided "extensions" and what teachers described as "quality work" (Macqueen, 2013, p. 304).

Learning opportunities are affected by expectations in ways that are not often visible, even to the teachers who provide the learning opportunities. As the National Council of Teachers of Mathematics' (NCTM) *Principles to Actions* (2014) describes,

> Too often…the capacities of so-called low-track students are underestimated, leading to these students receiving fewer opportunities to learn challenging mathematics. Low-track students

> encounter a vicious cycle of low expectations: Because little is expected of them, they exert little effort, their halfhearted efforts reinforce low expectations, and the result is low achievement. (p. 61)

This phenomenon was observed in a randomised experiment which showed that intermediate and lower achieving students in mixed-ability classes significantly outperformed similar students in tracked classes on tests that were calibrated for different ability levels (Linchevski & Kutscher, 1998). The "low ability" students in the mixed-ability setting reportedly found their test "relatively easy; they were accustomed to much higher demands and expectations" (p. 545). On a separate common test administered to all students, many of the students who were assigned to tracked low-ability classes handed in nearly blank tests and could not be assigned an average score, while comparable students in the mixed-ability classes scored an average of 54%. Both of these results suggested that students in the BCAG condition were generally held to lower expectations than similar students in the mixed-ability class, and that being grouped by ability affected not only their learning but also their perceptions of their own capabilities.

The impact of ability grouping on affective elements of student experience is a common finding, even when there are not significant difference in achievement (e.g., Macqueen, 2012, 2013). For example, research has shown that students placed in lower tracks have lower self-concepts (Chiu, Beru, Watley, Wubu, & Simson, 2008; Francis, Connolly, et al., 2017), can develop negative attitudes towards school (Belfi, Goos, De Fraine, & Van Damme, 2012), and can develop a diminished view of the value of learning mathematics (Zevenbergen, 2005). Teaching equitably requires teachers to provide rich learning experiences for all students, not only for them to master particular content, but to experience a sense of agency in terms of doing and learning mathematics (Aguirre et al., 2013; Gresalfi, Martin, Hand, & Greeno, 2008).

Alternate Approaches: Mixed-ability Groups

Several studies have shown that mixed-ability classes can be beneficial for all students (Boaler & Staples, 2008; Burris, Heubert, & Levin, 2006; Linchevski & Kutscher, 1998; Murata, 2013). Though many of these are at the middle or secondary levels, they have provided insights into how and why mixed-ability groupings can support equity. In general, this research has revealed the importance of mathematical discourse where students share, compare, and revise strategies, and teaching that conveys value for all ideas and all students. The findings also showed support for the use of tasks with "multiple entry points," in which students of all abilities can engage and make contributions, and in which "wrong" answers are treated as opportunities to learn. For example, Murata (2013) described how individual differences in elementary classes in Japan were leveraged to drive collective learning in what she describes as *inclusively responsive instruction*. Students of various abilities, all given the same task, moved through the stages, but taking different trajectories as they encountered different problems.

There are many other examples demonstrating that powerful learning can occur in classes with mixed abilities through the support of meaningful interactions between students (Goos, 2004; Kazemi & Stipek, 2001; Staples, 2008). Such teaching is rare in the United States, however, for several reasons. As teachers begin their careers, they draw on cultural notions of what it means to teach mathematics (Hiebert, 2013), which do not usually include the "norm that learning is social and that everyone is expected to contribute to the shared learning journey" (Murata, 2013, p. 328). Instead, teaching in the United States focuses on direct instruction on procedures and verification of individual students' ability to complete the procedures correctly (Givvin, Hiebert,

Jacobs, Hollingsworth, & Gallimore, 2005; Silver, Mesa, Morris, Star, & Benken, 2009). This finding supports the notion, and possibly the personal experience of teachers, that different ability levels are a barrier to be overcome rather than an asset to exploit. For example, if the learning goal is for students to learn to complete double-digit addition, but a significant portion of students in the class are already proficient in double-digit addition, the teacher must do something different with those students as she teaches the others the target method. In contrast, if students are to develop a method for adding double-digit quantities through comparison and discussion of alternative methods, then everyone can contribute. A student who knows the formal method can gain from trying to understand an informal method, while students with transitional methods can be exposed to the efficiencies of a more formal method. Incorporating such practices (e.g., having students compare, evaluate, and revise solution methods) requires United States teachers to adopt a substantially different perspective regarding the nature and purpose of mathematical activity and discourse (Munter, Stein, & Smith, 2015).

Teachers' Perspectives on Ability Grouping

Teachers tend to have mixed and conflicting perspectives on ability grouping practices. LeTendre, Hofer, & Shimizu (2003) reported that in the United States "respondents wanted all students to have the same educational opportunities yet also wanted schools to help individuals develop their potential as much as possible" (p. 69), ideas that seem difficult to reconcile in practice. As suggested by Linchevski & Kutscher (1998), "ideologically [teachers] favour diversity; practically they support ability grouping" (p. 545). In a 2008 *MetLife Survey of the American Teacher*, many teachers reported that their classes included such a range of abilities that teaching these classes felt impossible (Loveless, 2013). A study of primary school teachers and principals in Queensland revealed "universal" support for within-class ability grouping, and most participants expressed positive sentiments regarding at least part-time class-based tracking (Gallagher et al., 2011).

Tensions regarding the use of ability grouping with younger students could be driven by the competing ideas raised in the previous sections. Even if teachers value equity and are concerned about the consequences of ability grouping, conceiving of mathematics teaching as instilling formal procedural knowledge practically necessitates the separation of students into groups based on their incoming knowledge of the procedure to be taught. If teachers lack appreciation for the value of mathematical talk between students, it may be difficult for them to see the value in creating an environment in which students with differing ability levels talk about their ideas. As a case in point, Haimes (1999) found that across a variety of de-streamed classes in Australia, teachers reported making special provisions for low or high attaining students, such as less challenging tasks or additional projects, but did not stress problem solving or cooperative learning as core features of their mixed-ability classes. Complicating these tensions are notions that teachers have about students. If teachers believe that only some students can be good at mathematics, they may limit the opportunities that other students have to engage in explorations of mathematical concepts, relegating them to rote procedures and memorisation tasks (Arbaugh, Lannin, Jones, & Park-Rogers, 2006).

Novice Teachers Learning About Ability Grouping

There have been renewed efforts to embed discussions of equity into mathematics teacher preparation courses (Aguirre et al., 2013; Turner et al., 2012; White et al., 2016). The Association

of Mathematics Teacher Educator's *Standards for Preparing Teachers of Mathematics* (2017) states that effective teacher preparation programmes,

> help beginning teachers challenge deficit views about learning by questioning the status quo at a systemic level. For example, they consider testing and tracking systems that have instituted ways to identify, label, and separate children by perceived mathematics abilities. (p. 35)

Aguirre et al. (2013) go further in their framework of five equity-based practices in mathematics classrooms, specifying indicators for "nonrepresentative lessons" such as "often structures group work by ability" (p. 45) and "segregates specific students (for example, those viewed as 'low ability' or labelled as 'English language learners') from the main activities" (p. 47). These documents advocate efforts to help PSTs interrogate ability grouping practices.

Such efforts, however, are aimed at novices who are working to construct understandings of how schools work and also their own values and goals for their teaching, and they can struggle to process the mixed messages about ability grouping they receive from various sources. Neumayer-Depiper (2013) described the conflicted identity formation of one preservice teacher enrolled in a class that explicitly contested the use of ability category systems in mathematics teaching. The PST recognised a prevailing discourse about grouping students by ability, one that also emphasises mastery of basic skills by the "lower group" before any engagement in tasks requiring "higher-order thinking'" and found the labelling of students as "above," "on," or "below" troubling and inconsistent with the messages she had received in her coursework. She also doubted her ability to enact more equitable practices in certain school settings—such as those in low socio-economic areas, where she perceived policies as driven by test scores and saw little support for more equitable practices. This study emphasised the potentially constraining relationship between the various contexts in which novice teachers develop notions about what is possible for them to do as teachers of mathematics.

Other efforts to address equity in mathematics methods courses focus on helping PSTs surface their preconceptions and examine them through a critical lens. For example, Crespo (2016) described a case where a preservice teacher, Melissa[2], expressed resistance to using ambitious teaching practices and lessons because they were "so high above my children's learning level" (p. 66). As justification for ability grouping, Melissa conveyed concern about matching instruction to the students' "level" and seemed unaware of the potential consequences of her low expectations for such students. A set of commentaries on Melissa's case suggested that, rather than discounting her perspective, teacher educators could turn concerns like hers into objects of reflection for herself and other prospective teachers (Franke, 2016; Jackson, 2016; Stinson, 2016). That is, her questions could be "taken up, interrogated, and discussed in ways that allow students to consider themselves, their experiences, and their beliefs in relation to the schools in which they are working" (Franke, 2016, p. 72).

In this paper, we draw upon the idea of using cognitive conflict to instigate belief change (Shilling-Traina & Stylianides, 2013) to study PSTs' developing perspectives on ability grouping, both from their perspectives as learners of mathematics and future teachers of mathematics. This approach is based on Piaget's notion of disequilibrium, in which conceptual change comes as learners wrestle through conflicting ideas (Moshman, 2005). A central requirement for such cognitive conflict is becoming aware of current beliefs (Stylianides & Stylianides, 2009), which can

[2] All names are pseudonyms

often be held implicitly. We anticipated that many PSTs would have negative views of tracking based on their own experiences in schools, but would initially see WCAG in positive terms based on messages received from the culture and practices embedded in schools. Our approach was to use course assignments to 1) support PSTs in making their current beliefs explicit, and 2) engage them in grappling with conflicts between different beliefs in the context of the specific practice of ability grouping.

This approach is similar to the examples provided above in the case of Melissa's email (Crespo, 2016). In all of the commentaries on this case (Franke, 2016; Jackson, 2016; Stinson, 2016), teacher educators described working to challenge the beliefs of novices not by declaring their beliefs invalid, but by engaging them in experiences and reflections that put those beliefs in conflict with other experiences or perspectives.

Research Design

In this paper, we draw on data from course assignments to answer the following questions about PSTs' views on ability grouping practices.

1. How do PSTs describe their own personal experiences with ability grouping in mathematics? How do these experiences relate to their beliefs about their own mathematics ability?
2. What are the relationships between PSTs' ability grouping experiences and their perspectives on the practice of ability grouping in general?
3. What are the relationships between PSTs' ability grouping experiences and their perspectives on WCAG in elementary schools?
    a. Do PSTs recognize the use of WCAG practices in their field placement classes?
    b. In what ways do they attend to issues of equity with regard to WCAG practices?

The purpose of this study is not to determine whether our efforts "worked" in terms of changing beliefs or practice, but to better understand the extent to which PSTs' ability grouping experiences can be leveraged for supporting critical interrogation of WCAG practices in elementary mathematics instruction.

Data Collection

Data for this paper came from two assignments given to 88 elementary PSTs enrolled in the second of two mathematics methods courses at a large university in the Midwest region of the United States. These PSTs, who were in their second year of the three-year teacher preparation programme, were separated into four sections of the same course taught by four different instructors. In addition, each course included a field experience component in which the PSTs completed weekly observations in the classroom of a current full-time elementary teacher (their "host teacher"). Full ethical approval was gained for this study.

For the first assignment, PSTs read the chapter "Stuck in the Slow Lane" by Jo Boaler (2008), which outlines the limitations of "tracked" classes (BCAG) and the benefits of mixed-ability groups. They then wrote a reflection describing their experiences with ability grouping, how mathematics instruction was different in different tracks, and their feelings associated with these experiences. The assignment asked them to describe situations of "'high' students being separated from 'low'

students." Although the PSTs mostly described BCAG, which they generally referred to as "tracking," they also described some instances of WCAG.

In the second assignment, PSTs interviewed their host teacher about the teacher's strategies for "differentiating instruction," including questions about how small groups are selected and whether different assignments are provided for different students. The interviews were recorded by PSTs but not submitted for class or retained for research. Using the recordings, the PSTs wrote a 3 to 4-page reflection in which they described the host teacher's differentiation practices, evaluated whether some students were being provided different opportunities to learn than others, and, drawing on the Boaler chapter (2008), described similarities and differences between "tracking" and the teacher's differentiation practices. In order to mitigate the possibility that participants' responses would be unduly influenced by their perceptions of their instructor's views on tracking, in both cases, grades for the assignment were based on generic indications of quality: completeness, level of detail, connections to readings, and writing quality.

Analysis

Both authors, each of whom was an instructor of one of the four sections of the methods course, analysed Assignment 1 and Assignment 2 separately and holistically, using multiple categories of codes for each assignment. For Assignment 1, we established codes in three categories: primary ability group as characterised by the PST (*high, middle, low, mixed,* or *none*), perceptions of mathematical ability (*relatively good at math, middle ability*, *relatively not good at math*, or *unclear*),[3] and perspectives on ability grouping (*mostly positive*, *mixed*, *mostly negative*, or *unclear or not addressed*).[4] We also recorded what the PST indicated in response to the question about when they first noticed mathematics tracking in their schooling (the grade level or grade band).

For Assignment 2, we used two holistic categories to code each PST's paper: whether PSTs recognized WCAG practices in their host classrooms, and, if so, whether they described any potential inequities that could result from the use of WCAG. For all codes, we established inter-rater reliability greater than 80%. After coding assignments for all 88 PSTs, we used spreadsheet pivot tables to examine relationships between the coded assignments; for example, ability group versus perspective on ability grouping, ability group versus perception of mathematical ability, and perspective on ability grouping versus recognition of potential inequities resulting from WCAG practices.

Results

Descriptions of Ability Grouping Experiences (Assignment 1)

Only three of the 88 participants claimed they had not experienced any ability grouping in mathematics. Nearly half of the PSTs (37) reported experiencing some form of ability grouping

[3] Although the assignment did not explicitly ask students to offer perceptions of their mathematical ability, many did so.

[4] Although the prompt references how PSTs "felt" about tracking, we attended to both feelings and thoughts in assessing whether "perspectives" were positive or negative, as the impacts of ability grouping can be both affective (how one feels about mathematics and oneself as a doer of mathematics) and cognitive (what learning opportunities are provided as a result of ability grouping).

prior to sixth grade, including 24 PSTs who explicitly described ability grouping (usually WCAG) in third grade or before. Figure 1 shows a distribution of how PSTs across different ability group experiences perceived their mathematical ability. The chart shows that PSTs' perceptions of their mathematical abilities were related to their ability grouping experiences in the way one might expect: high group/track students generally described themselves as being good at mathemathics, while low group/track students were much less likely to do so.

PSTs' descriptions of differences between classes in BCAG contexts often focused on pacing and homework. For example, one PST with experiences in higher tracks, Claire, wrote,

> We were going home with hours of homework every week, taking hard tests, having pop quizzes, and taking [Advanced Placement] courses. The college prep kids seemed to not get as much work and it didn't seem as challenging as ours.

Some PSTs went further, explicitly describing how the nature of instruction was different in different ability grouped classes. For example, Rebecca, another PST who experienced high track grouping, wrote, "they gave us less instruction, and encouraged us to problem solve more. They gave us more challenges and difficult problems that used a lot of critical thinking to solve." A PST who experienced primarily low tracks, Carrie, wrote, "I remember being jealous of my friends in the higher tracks because they would talk about the fun math games they would play, or the group work they did, or how they got to teach a problem in front of the whole class."

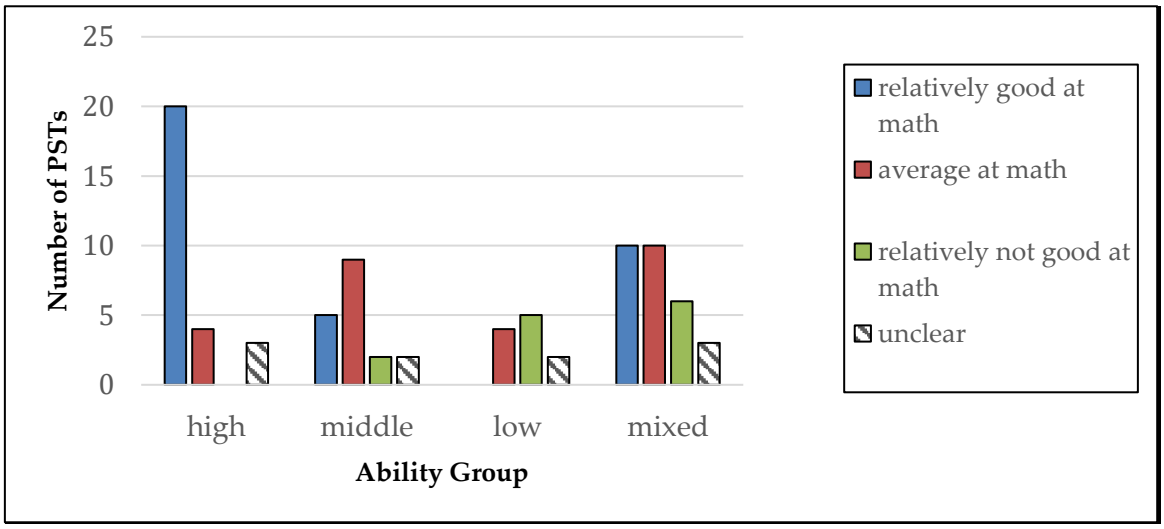

Figure 1. Distribution of ability grouping experiences across perceptions of mathematical ability.

These descriptions suggest higher expectations for students grouped into in "higher" classes in BCAG settings. Some PSTs seemed to extend these into assumptions about the innate ability of students in the different classes. Phoebe, who experienced lower track classes, wrote,

> From my impression, it felt like the higher track students just understood math. It didn't seem like they had to do a lot of examples to understand a concept, and it felt like they were treated almost like adults.

This comment connects ability ("just understood math") to the expectations that were conveyed by the instruction ("were treated almost like adults"). Phoebe described getting to visit a higher

track mathematics class as part of her work on the school yearbook committee, and she was surprised by the activity she witnessed:

> I realized that these students were so good at math that they were able to come up with their own methods to solve a problem and figure out how to explain it to the teacher so that their thinking made sense to her.

Many PSTs discussed the status that was attached to being in a particular ability group. Although our analytic framework was not primarily designed to capture affect, these descriptions were often laden with emotional language, including expressions of superiority and inferiority in relation to classmates and friends, as well as descriptions of increased confidence in abilities and restricted advancement in mathematics. PSTs used words like "ashamed," "embarrassed," "devastated," "mortified," "stupid," "confident," "smart," and "successful" to express their feelings about being tracked. For example, Shawna described her feelings about being placed in a lower track class:

> It was honestly confusing how I could still be in a math class with the students I looked at and considered to be less smart than me… I finally felt like I belonged in the regular math class, which was a harsh wake-up call. For me, I didn't want to fit in with these students. I wanted to stand out and be a star student because I saw them as being lower achieving students than I was.

Shawna describes a clear "type" of student in the "regular math class," students who are "lower achieving" and "less smart," while "star students" get to be in the higher tracks.

Other PSTs talked about differences between students in different tracks in terms of work ethic. Tricia, who experienced high tracking, wrote that she and her classmates were given more homework and moved at a faster pace "because we could handle it, because of work ethic and other factors." Violet, who experienced lower tracks, wrote, "I was one of a few students who took their work seriously in that class and sometimes felt it was too dumbed down for me." Similarly, Beth wrote:

> I found myself in a class with a lot of trouble makers and under achievers. I was so frustrated because I'd always been very intrinsically motivated to well in school and had a type A personality, so I couldn't understand why I was placed with all these students.

Like PSTs who described the separations of students in BCAG contexts as indications of "smartness," these descriptions seemed to convey that traits of students are fixed, and that one of the consequences (if not purposes) of tracking was to separate students by these traits. According to this perspective, smart, hardworking, "star students" are placed in high ability classes, while "trouble makers" and "under achievers" are placed in low ability classes.

Overall, the PSTs in our study experienced ability grouping in much the way we expected, describing some of the consequences that teacher educators are most concerned about, such as encouraging rigid perspectives about who is and can be good at mathematics (Association of Mathematics Teacher Educators, 2017). Now we turn our attention to how these experiences seemed to influence their views about ability grouping practices more generally and their perspectives on the WCAG they witnessed in their field placements.

Relationships Between Ability Grouping Experiences and Views About Ability Grouping (Assignment 1)

PSTs with different ability grouping experiences expressed different views about the practice of ability grouping generally. Across the 88 participants, almost half of the PSTs held mostly negative

views about ability grouping while 13 PSTs held mostly positive views. Interestingly, PSTs with mixed-ability grouping experiences held the clearest negative views about ability grouping (see Figure 2).

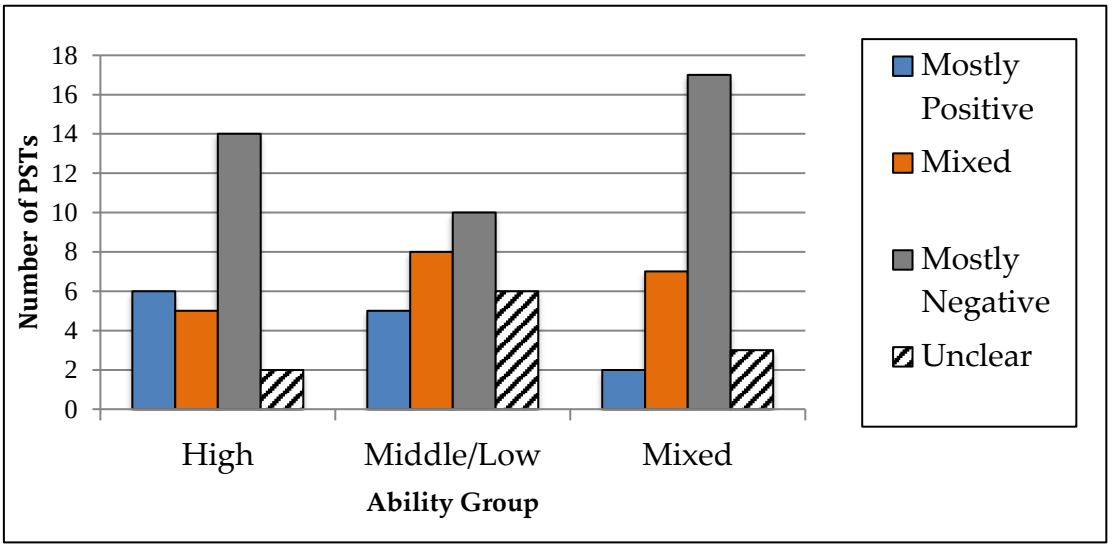

Figure 2. Views about ability grouping versus ability grouping experience.

Some PSTs with positive views about ability grouping explained that it allowed teachers to meet their students' needs and maintain high expectations for all students. In other words, rather than seeing ability grouping as inequitable because students have different learning opportunities, they saw it as equitable because students "get what they need." In some cases, this was expressed in a personal way, particularly from students in lower or middle tracks. For example, Phoebe wrote, "I didn't mind being in the average math track because I knew that I was accurately placed. I would have been bored in the lower track, and very lost in the higher track." Crystal wrote, "I do know that had I been mixed into a class with highest level students in my grade that I would have felt even more discouraged." These descriptions can be seen as an internalisation of the messages that are sent by ability grouping practices; that ability is fixed and that only certain types of students can be good at mathematics.

A stronger, more universal version of this idea was sometimes expressed by PSTs, often by students with experience in high tracks. For example, Theresa wrote,

> Mixed-ability classrooms take away the challenge for the students who are already succeeding. I do not think we should have inclusive classrooms because instead of evening the playing field, we are lowering our standards. Instead of pulling others up to the level of our successful students, we are dragging our successful students down to a lower level of achievement.

This theme was repeated, with one PSTs claiming that mixed-ability classes were bad for gifted students, who are bored "while the struggling students skipped, acted out, or slept to avoid doing work they couldn't do and had no help doing or learning" (Erin). These comments reiterated themes of labelling and status differences described in the last section, but the PSTs in these cases are supportive of ability grouping precisely because they separate students into "appropriate" groups.

The PSTs who had negative views about ability grouping often talked about it restricting students' development or placing a label on their ability. Cat, who experienced high tracks, wrote:

> [Now] I realize how demoralizing it must have been for the kids who were placed in the 'lower level' track. My confidence as one of the students in the more difficult math classes was constantly being built up by my peers and teachers. ... I think that providing this opportunity to all students, and not dividing them up into different tracks, would help them to learn more and to gain confidence in themselves.

This excerpt shows how some PSTs started to recognise and question the messages that were being conveyed by ability grouping. Specifically, Cat noted some advantages provided in her high track classes and wondered why all students should not have access to such advantages. Similarly, Kate noted, "When required to be placed into an ability-group, it automatically labels you, and could possibly label you for the remainder of your mathematical career."

Some PSTs explicitly mentioned the teacher's role in BCAG contexts and expressed mixed feelings about whether ability grouping influenced teachers' expectations about students. While some PSTs believed that teachers in lower track classes did their best to not underestimate their students and display confidence in them, others stated that teachers in such tracks treated students, in the words of Delores, "as if we were unable to comprehend content." Paula recognised the potential implications of these low expectations: "I can absolutely see how if a teacher, a highly respected adult in control of your learning, seemingly does not see any potential in your abilities you, as a student, would not either." On the other hand, Fiona wrote that her teacher "took the time to meet with me several times a week outside of class and refused to give up on me even when I wanted to give up on myself." Notably, these statements projected a view that the effects of ability grouping are determined primarily by the teacher and not by the ability grouping itself. Gwen expressed this succinctly, writing, "I feel at every level students needed the same things: a teacher who engaged them and helped them achieve."

Similarly, PSTs expressed concerns about the *implementation* of tracking systems that failed to question the basic premise behind ability grouping. For example, some described that the tests used to determine placement in the tracks do not accurately capture student ability. Tara wrote,

> For a teacher to decide who the high and low students are after a state-wide test like this isn't something that should happen. Some students have test anxiety where they don't do well on exams because they are so anxious throughout it.

Others criticised the lack of flexibility in movement between tracks (Kyra: "It seems a little ridiculous to me now that my future would be based off of this one test") or thought that "math tracking placement should be somewhat chosen by the student" (Ali). These statements do not directly challenge ability grouping as a practice; instead, they argue for ways that ability grouping could be done in ways that mitigate its potentially harmful effects.

PSTs' Reflections on WCAG Practices in Elementary Classes (Assignment 2)

On the second assignment, 49 of the 88 PSTs identified at least some WCAG practices in their host teacher's class. Of these, 24 expressed support for them, often describing the practices as equitable because they meet the needs of students. Some expressed direct disagreement with Boaler's criticism of ability grouping. For example, Theresa stated clearly that,

> Ms. Rogers has been using similar practices to tracking. While her students are in elementary school, and therefore cannot be put into different levelled classes, they are predominantly grouped by achievement.

Then Theresa wrote,

> I would say that is a form of tracking (and good teaching). Teaching to students needs at differing levels is tracking. That is the purpose of tracking, and I think Ms. Rogers has it right when she splits her students into fluid groups.

Other PSTs were less directly supportive of WCAG. They admitted that WCAG practices were occurring but expressed that these were not inequitable because of certain conditions, like the students not being aware of their placement into a low group, or the fact that the host teacher stated that group membership can change during the year. For example, Jenny (middle track, mixed perspective on ability grouping) described how the teacher used "math stations in which they get grouped in different levels that are based on previous math scores they took in the beginning of the year," and acknowledged that "Jo Bohler [sic] would have a problem with these [ability] groups." But then the PST wrote that,

> Giving different assignments are helpful in fact she says the kids don't notice because she makes no big fuss about it. They all are working on their own stuff it is hard for them to see that a few kids spend extra time at the back table with her because everyone does throughout the day.

Corinne also contrasted BCAG practices with WCAG, arguing that WCAG was less likely to confer deficit status on students because the grouping was less visible:

> With tracking [BCAG] I think this concept is more tangible and effects [sic] our ability to see ourselves as good students. With differentiated instruction [WCAG] I think students have a much harder time telling whether they are being grouped into certain groups based on what they need."

Several PSTs expressed the opinion that WCAG is in fact an equitable way of providing all children with opportunities to learn, arguing that the instruction is matched to the specific child. Rachel wrote, "Having different opportunities to learn doesn't hold back the students, but focuses on their needs to help them be the most successful student they can be." Zoe wrote,

> I think that having completely different homework assignments enhances the ability groupings even more … . Since each group is individualized and receives the same amount of attention and guidance as any other group, they are all more successful because of this. Each group, regardless of comprehension, is given the opportunity to succeed.

These PSTs project an individualistic perspective on opportunity to learn that acknowledges different needs, but does not acknowledge the different expectations to which students are often held when placed in groups by ability.

Overall, on Assignment 2, 26 PSTs described inequities that could be perpetuated or exacerbated by ability grouping practices. Several specifically referenced the experiences they had witnessed in their placement:

> I have noticed that the students that are placed in the "lower" level groups have less motivation than those in the "higher" level groups … . [One student] has also pretended (while I was working with her) that she could not do things that I had previously seen her do on her own. The lower expectations that the teacher has set for her has led to a lack of motivation, and the limiting of her potential.

This PST, Cat, has recognised that WCAG has, for at least one student, produced observable negative consequences.

There were some PSTs with mixed perspectives. For example, Phoebe wrote,

> On one hand, [ability grouping] allows the students to get specific instruction that is at a pace that is suited for them and their learning, but on the other, it may hinder them and keep them on a track that is either too advanced or not advanced enough."

This example suggests that at least some PSTs were experiencing some cognitive dissonance as they worked through their views about WCAG.

In our analysis, we looked to see if PSTs who were positive about ability grouping when discussing their *own* experiences (Assignment 1) were less likely to notice inequitable consequences of the WCAG that they witnessed in their field placement (Assignment 2) (see Figure 3). We did not find such a relationship. Instead, we found many PSTs who had negative views about their own ability grouping experiences failed to note any potential inequitable consequences of the WCAG practices in their host teachers' classes.

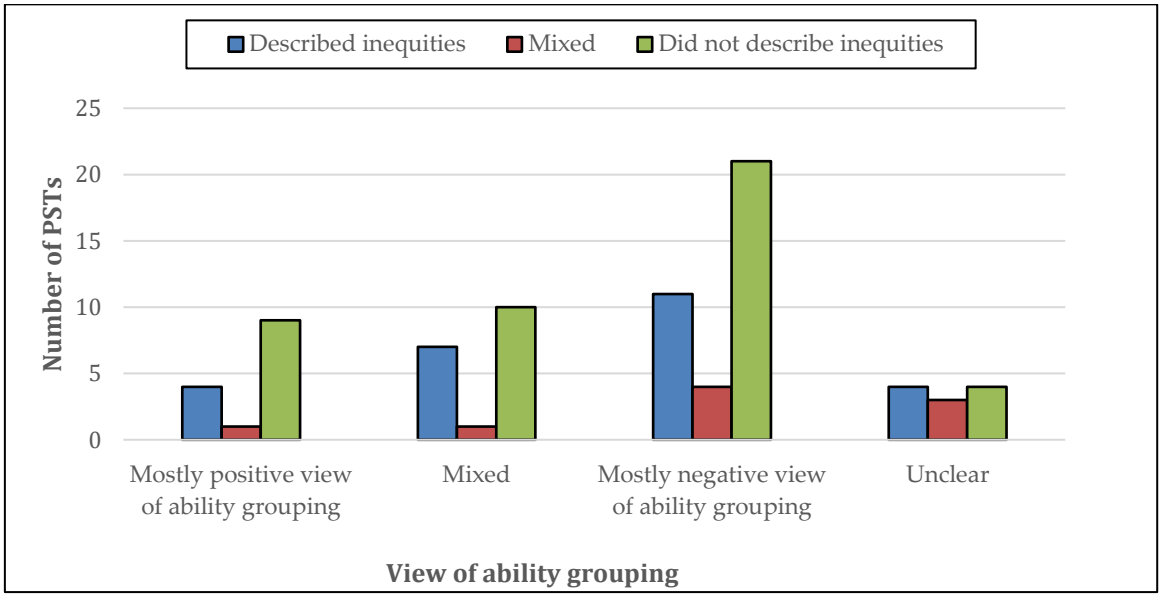

Figure 3: PSTs' perspectives on ability grouping (Assignment 1) versus whether PSTs noted potential inequitable consequences of WCAG (Assignment 2). Note: This figure does not include PSTs who did not identify WCAG in their host teachers' class.

These students did not seem to make a connection between the negative statements they had made about ability grouping generally and the WCAG they had witnessed in their placement. They found ways to justify why WCAG was acceptable despite their negative experiences with ability grouping.

After seeing these results, we wondered whether PSTs who were negative about ability grouping were thinking primarily about their tracking experiences in middle and high school, rather than WCAG in elementary school. So, we looked to see whether PSTs who had experienced ability grouping during elementary school were more likely to note inequitable consequences of

the WCAG practices that they witnessed in their field placement. However, there appeared to be no relationship. PSTs who experienced ability grouping in elementary grades were just as likely to be critical of practices in their host teacher's class as those who did not experience ability grouping until middle or high school.

Discussion

The purpose of the ability grouping reflection assignments was to surface PSTs' ideas about ability grouping, with the premise that these might provide leverage for challenging views about WCAG practices in elementary schools (Shilling-Traina & Stylianides, 2013). Our findings revealed that many PSTs do indeed harbour negative feelings about their own ability grouping experiences. In some cases, these were described as formative experiences in which PSTs' beliefs about themselves and their mathematical identities were grounded (Neumayer-Depiper, 2013; Welder & Champion, 2011). Negative sentiments were expressed by students whose experiences were very different, including those who were in high tracks for most of their schooling as well as those who were predominantly in low or middle tracks.

These findings provide some support for the idea that sharing and discussing ability grouping experiences in a methods course could potentially support a more critical perspective about ability grouping generally by creating disequilibrium between held beliefs and current experiences. Many PSTs, based on their own experiences, described ability grouping as a neutral or positive practice, often justifying this by saying that it "worked for me." They may assume that it "worked" for everyone. But our data show that they have peers with similar experiences who feel very differently about ability grouping. These cases show, often powerfully, that ability grouping did not "work" for them. Encouraging conversations between such students may support critical questioning about the effects of ability grouping.

Although negative ability grouping experiences may seem to be a natural focus for these conversations, positive experiences with ability grouping could be also be useful to share in methods courses, particularly from PSTs who experienced a high track environment in which mathematical talk and problem solving was supported and encouraged. PSTs could be challenged to justify why all children should not be provided such learning environments, regardless of ability. These perspectives could be connected to how WCAG practices can result in differential expectations, and subsequently, inequitable learning opportunities for students (Association of Mathematics Teacher Educators, 2017). Several PSTs noted that being tracked did impact their perceptions of themselves and their "smartness," and this was true of students who were in high groups as well as low. Interpretations of ability grouping as indications of general competence and status have been noted in other studies (Belfi et al., 2012; Boaler & Staples, 2008; Chiu et al., 2008) and stand in sharp contrast to, for instance, the ways that students in some detracked environments talk about themselves and their classmates (e.g., Boaler & Staples, 2008).

However, this study also revealed several challenges to using PSTs' experiences with ability grouping as a primary motivator for questioning WCAG in elementary classes. Even in Assignment 1, many PSTs expressed a positive view of ability grouping, using some form of the argument that "I was in the right track for me," a perspective that was also evident in other studies (e.g., Forgasz, 2010). From our viewpoint, PSTs' belief that they have a fixed mathematical ability that makes certain "levels" unattainable is itself a consequence of ability grouping and is reinforced by teaching practices that emphasise a narrow view of mathematical competence as the ability to

recall facts and perform procedures (Boaler, 2008). In this sense, our participants have even more fundamental assumptions about teaching and learning that seem not to be adequately challenged.

Assignment 2 revealed even deeper challenges. PSTs did not always see the potentially inequitable consequences of the WCAG that they witnessed in their host teachers' classes, even if they had a generally negative view of ability grouping based on their own experiences. Similarly, experiencing ability grouping at an early age also was not related to a more negative stance regarding witnessed WCAG practices. These seem somewhat counterintuitive. If their own experiences with ability grouping practices in elementary school were negative, why would they be supportive of such practices when witnessed in their host teachers' classes?

One possibility is that PSTs' own experiences are too far removed from what they see in schools to perceive any cognitive dissonance. Ability grouping often made them feel stuck, labelled, and disinterested in mathematics. But it may be too easy to find reasons why WCAG in elementary grades is different than the ability grouping, often BCAG, that they experienced as learners of mathematics. For example, WCAG may be seen as more acceptable if students seemed unaware of their group's label or if the teacher was supportive of students at each level. These reasons suggest that the PSTs tended to view ability grouping as an individual practice rather than a cultural practice. That is, they attended to the thoughts and feelings of individual teachers and students rather than the larger effects on groups of students, a phenomenon also reported about United States teachers by LeTendre, Hofer, & Shimizu (2003). For example, PSTs who believed that WCAG was acceptable as long as individual students were not *aware* that they were in a lower group tended not to consider that these students might have lower quality opportunities to learn and might, as a group, achieve less.

In retrospect, we believe that our intervention failed to raise attention about these larger group effects. By asking PSTs to reflect on their own individual experiences, we may have encouraged them to think only in terms of how individual teachers and students experienced ability grouping. In the future, we recommend including data and discussions about the systemic effects of ability grouping, particularly on students in disadvantaged groups (Battey et al., 2013; LeTendre et al., 2003; Oakes, 2005).

Another trend we noted was PSTs' tendency to focus on the good intentions of the host teacher rather than the impact of their practices. This may have been exacerbated by the fact that the PSTs were asked to comment on the practices of their host teacher, with whom they spent about 60 hours over the course of the semester developing a mentor/mentee relationship. Asking PSTs to question the practices used by the host teacher, the expert in their relationship, may have been difficult and, in retrospect, may not have been honourable to the host teacher who was donating time and energy to support teacher education. On the other hand, the host class is the PSTs' most direct connection to students and to teaching practice and perhaps the best opportunity to question normative approaches to grouping students.

Another challenge, we surmise, was PSTs' lack of experience with effective alternatives to WCAG (e.g., open tasks, mathematical discourse). Even if PSTs come to question WCAG practices, without the skill to support a diverse classroom that takes advantage of various ways of thinking, they may fall back on WCAG as the only way to cope with the range of students' prior knowledge. As Murata (2013) notes, this is a significant barrier in the United States:

> In Japan, resources are available to help all teachers understand and gain the skills to take advantage of individual differences to drive collective learning, whereas in the United States this kind of teaching is often considered possible only for a few talented teachers. (p. 317)

This suggests that PSTs' perspectives on ability grouping are linked to their perceptions about mathematics and mathematics teaching more generally, and certainly underscores the challenge facing teacher educators who are trying to balance a plethora of learning objectives (Goffney & Crespo, 2016).

Conclusion

In this study we explored relationships between PSTs' perspectives on their own ability grouping experiences and their views about the WCAG practices used in the elementary classrooms that they observed as part of their teacher education programme. We sought to understand the extent to which these perspectives might be useful for challenging normative practices that continue to sort students and provide inequitable learning opportunities. Our data are limited in that they consist of assignments completed in the context of a class, where PSTs may have incentives to produce "socially desirable" responses. However, the range of responses, and especially the number of responses that failed to critique ability grouping, suggested that many PSTs were either unaware of the "correct" responses or felt comfortable in expressing their own viewpoint.

We found that PSTs' perspectives on their own ability grouping experiences brought many important ideas to the surface, including many of the potentially negative effects of ability grouping on individual students' experience of learning mathematics and on their views of themselves as mathematics learners. However, while some participants expressed that labelling and separating students into tracks was detrimental in their own experiences and used this to question the effects of ability grouping in schools, others described ability grouping as an effective way to support the learning of all students. Failing to facilitate reflection on these views is likely to result in a continuation of ability grouping practices and the perpetuation of inequities within elementary classrooms.

It is our hope that other teacher educators will continue to explore ways to challenge PSTs' perspectives on ability grouping not only by drawing on PSTs' experiences but also by extending the focus beyond the individual. Such efforts are important if mathematics teaching is to reach the ambitious standard that "all students have access to a high-quality mathematics curriculum, effective teaching and learning, high expectations, and the support and resources needed to maximize their learning potential" (NCTM, 2014, p. 59).

References

Aguirre, J., Mayfield-Ingram, K., & Martin, D. B. (2013). *The impact of identity in K-8 mathematics: Rethinking equity-based practices*. Reston, VA: National Council of Teachers of Mathematics.

Arbaugh, F., Lannin, J., Jones, D. L., & Park-Rogers, M. (2006). Examining instructional practices in Core-Plus lessons: Implications for professional development. *Journal of Mathematics Teacher Education, 6*, 517-550.

Archer, L., Francis, B., Miller, S., Taylor, B., Tereshchenko, A., Mazenod, A., . . . Travers, M.-C. (2018). The symbolic violence of setting: A Bourdieusian analysis of mixed methods data on secondary students' views about setting. *British Educational Research Journal, 44*(1), 119-140.

Association of Mathematics Teacher Educators. (2017). *Standards for preparing teachers of mathematics.* Retrieved from amte.net/standards

Battey, D., Llamas-Flores, S., Burke, M., Guerra, P., Kang, H. J., & Kim, S. H. (2013). ELL policy and mathematics professional development colliding: Placing teacher experimentation within a sociopolitical context. *Teachers College Record, 115*(6), 1-44.

Belfi, B., Goos, M., De Fraine, B., & Van Damme, J. (2012). The effect of class composition by gender and ability on secondary school students' school well-being and academic self-concept: A literature review. *Educational Research Review, 7*, 62-74.

Boaler, J. (2008). *What's math got to do with it? How parents and teachers can help children learn to love their least favorite subject.* NY: Penguin Books.

Boaler, J., & Staples, M. (2008). Creating mathematical futures through an equitable teaching approach: The case of Railside School. *Teachers College Record, 110*(3), 608-645.

Burris, C. C., Heubert, J. P., & Levin, H. M. (2006). Accelerating mathematics achievement using heterogeneous grouping. *American Educational Research Journal, 43*(1), 105-136.

Chiu, D., Beru, Y., Watley, E., Wubu, S., & Simson, E. (2008). Influence of math tracking on seventh-grade students' self-beliefs and social comparisons. *The Journal of Educational Research, 102*(2), 125-135.

Crespo, S. (2016). Why are you asking for these impossible math lessons? In D. Y. White, S. Crespo, & M. Civil (Eds.), *Cases for mathematics teacher educators: Facilitating conversations about inequities in mathematics classrooms* (pp. 63-70). Charlotte, NC: Information Age Publishing.

Dunne, M., Humphreys, S., Dyson, A., Sebba, J., Gallannaugh, F., & Muijs, D. (2011). The teaching and learning of pupils in low-attainment sets. *The Curriculum Journal, 22*(4), 485-513.

Forgasz, H. (2010). Streaming for mathematics in Years 7-10 in Victoria: An issue of equity? *Mathematics Education Research Journal, 22*(1), 57-90.

Francis, B., Archer, L., Hodgen, J., Pepper, D., Taylor, B., & Travers, M.-C. (2017). Exploring the relative lack of impact of research on 'ability grouping' in England: a discourse analytic account. *Cambridge Journal of Education, 47*(1), 1-17.

Francis, B., Connolly, P., Hodgen, J., Mazenod, A., Pepper, D., Sloan, S., . . . Travers, M.-C. (2017). Attainment grouping as self-fulfilling prophesy? A mixed methods exploration of self confidence and set level among Year 7 students. *International Journal of Educational Research, 86*, 96-108.

Franke, M. (2016). Identifying and supporting the next small step together: A commentary on Crespo's case. In D. Y. White, S. Crespo, & M. Civil (Eds.), *Cases for mathematics teacher educators: Facilitating conversations about inequities in mathematics classrooms* (pp. 71-74). Charlotte, NC: Information Age Publishing.

Gallagher, S., Smith, S. R., & Merrotsy, P. (2011). Teachers' perceptions of the socioemotional development of intellectually gifted primary aged students and their attitudes towards ability grouping and acceleration. *Gifted and Talented International, 26*(1), 11-24.

Gamoran, A. (1992). Is ability grouping equitable? *Educational Leadership, 50*(2), 11-17.

Givvin, K. B., Hiebert, J., Jacobs, J. K., Hollingsworth, H., & Gallimore, R. (2005). Are there national patterns of teaching? Evidence from the TIMSS 1999 video study. *Comparative Education Review, 49*(3), 311-343.

Goffney, I., & Crespo, S. (2016). Conversations about inequities in mathematics methods courses. In D. Y. White, S. Crespo, & M. Civil (Eds.), *Cases for mathematics teacher educators: Facilitating conversations about inequities in mathematics classrooms*. Charlotte, NC: Information Age Publishing.

Goos, M. (2004). Learning mathematics in a classroom community of inquiry. *Journal for Research in Mathematics Education, 35*(4), 258-291.

Gresalfi, M., Martin, T., Hand, V., & Greeno, J. (2008). Constructing competence: An analysis of student participation in the activity systems of mathematics classrooms. *Educational Studies in Mathematics, 70*, 49-70.

Haimes, D. (1999). Teachers' strategies for implementation of de-streaming in secondary mathematics classes. *Mathematics Education Research Journal, 11*(2), 94-108.

Herbel-Eisenmann, B., Bartell, T. G., Breyfogle, L., Bieda, K., Crespo, S., Dominguez, H., & Drake, C. (2013). Strong is the silence: Challenging interlocking systems of privilege and oppression in mathematics teacher education. *Journal of Urban Mathematics Education, 6*(1), 6-18.

Hiebert, J. (2013). The constantly underestimated challenge of improving mathematics instruction. In K. R. Leatham (Ed.), *Vital Directions for Mathematics Education Research* (pp. 45-56). NY: Springer.

Hiebert, J., & Grouws, D. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester, Jr. (Ed.), *Second Handbook of Research on Mathematics Teaching and Learning*. Charlotte, NC: Information Age Publishing.

Ireson, J., Hallam, S., & Hurley, C. (2007). What are the effects of ability grouping on GCSE attainment? *British Educational Research Journal, 31*(4), 443-458.

Jackson, C. (2016). Equitable mathematics teaching for all students: A commentary on Crespo's case In D. Y. White, S. Crespo, & M. Civil (Eds.), *Cases for mathematics teacher educators: Facilitating conversations about inequities in mathematics classrooms* (pp. 75-78). Charlotte, NC: Information Age Publishing.

Johnston, O., & Wildy, H. (2016). The effects of streaming in the secondary school on learning outcomes for Australian students - A review of the international literature. *Australian Journal of Education, 60*(1), 42–59.

Kazemi, E., & Stipek, D. (2001). Promoting conceptual thinking in four upper-elementary mathematics classrooms. *The Elementary School Journal, 102*(1), 59-80.

LeTendre, G. K., Hofer, B. K., & Shimizu, H. (2003). What is tracking? Cultural expectations in the United States, Germany, and Japan. *American Educational Research Journal, 40*(1), 43-89.

Linchevski, L., & Kutscher, B. (1998). Tell me with whom you're learning, and I'll tell you how much you've learned: Mixed-ability versus same-ability grouping in mathematics. *Journal for Research in Mathematics Education, 29*(5), 533-554.

Loveless, T. (2013). *The 2013 Brown Center Report on American Education: How well are American students learning?* (Vol. 3). Washington D.C.: The Brookings Institution.

Macqueen, S. E. (2010). Primary teachers attitudes in achievement-based literacy classes. *Issues in Educational Research, 20*(2), 118-136.

Macqueen, S. E. (2012). Academic outcomes from between-class achievement grouping: the Australian primary context. *The Australian Educational Researchers, 39*(1), 59-73.

Macqueen, S. E. (2013). Grouping for inequity. *International Journal of Inclusive Education, 17*(3), 295-309.

Moshman, D. (2005). *Adolescent psychological development: Rationality, morality and Identity*. Mahwah, NJ: Lawrence Erlbaum.

Mujis, D., & Dunne, M. (2010). Setting by ability--or is it? A quantitative study of determinants of set placement in English secondary schools. *Educational Research, 52*(4), 391-407. doi:10.1080/00131881.2010.524750

Munter, C., Stein, M. K., & Smith, M. S. (2015). Dialogic and direct instruction: Two distinct models of mathematics instruction and the debate(s) surrounding them. *Teachers College Record, 117*(11), 1-32.

Murata, A. (2013). Diversity and high academic expectations without tracking: Inclusively responsive instruction. *Journal of the Learning Sciences, 22*(2), 312-335.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.

Neumayer-Depiper, J. (2013). Teacher identity work in mathematics teacher education. *For the Learning of Mathematics, 33*(1), 9-15.

Oakes, J. (2005). *Keeping track: How schools structure inequality* (2nd ed.). New Haven, CT: Yale University Press.

Shilling-Traina, L. N., & Stylianides, G. J. (2013). Impacting prospective teachers' beliefs about mathematics. *ZDM Mathematics Education, 45*(3), 393-407.

Silver, E. A., Mesa, V. M., Morris, K. A., Star, J. R., & Benken, B. M. (2009). Teaching mathematics for understanding: An analysis of lessons submitted by teachers seeking NBPTS certification. *American Educational Research Journal, 46*(2), 501-531.

Sleeter, C. E. (2001). Preparing teachers for culturally diverse schools: Research and the overwhelming presence of whiteness. *Journal of Teacher Education, 52*(2), 94-106.

Staples, M. (2008). Promoting student collaboration in a detracked, heterogenous secondary mathematics classroom. *Journal of Mathematics Teacher Education, 11*, 349-371.

Stinson, D. W. (2016). Turning disappointing student emails into teachable moments: A commentary on Crespo's case. In D. Y. White, S. Crespo, & M. Civil (Eds.), *Cases for mathematics teacher educators: Facilitating conversations about inequities in mathematics classrooms* (pp. 79-83). Charlotte, NC: Information Age Publishing.

Stoehr, K. J. (2017). Building the wall brick by brick: one prospective teacher's experiences with mathematics anxiety. *Journal of Mathematics Teacher Education, 20*(2), 119-139.

Stylianides, G. J., & Stylianides, A. J. (2009). Facilitating the transition from empirical arguments to proof. *Journal for Research in Mathematics Education, 40*(3), 314-352.

Turner, E., Drake, C., Roth McDuffie, A., Aguirre, J., 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*, 67-82.

Welder, R. M., & Champion, J. (2011). Toward an understanding of graduate preservice elementary teachers as adult learners of mathematics. *Adults Learning Mathematics: An International Journal, 6*(1), 20-40.

White, D. Y., Crespo, S., & Civil, M. (Eds.). (2016). *Cases for mathematics teacher educators: Facilitating conversations about inequities in mathematics classrooms* (Vol. 1). Charlotte, NC: Information Age Publishing.

Zevenbergen, R. (2005). The construction of a mathematical habitus: Implications of ability grouping in the middle years. *Journal of Curriculum Studies, 37*(5), 607-619.

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