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Teacher attitudes towards streaming in mathematics education

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Abstract
In this study, teacher attitudes towards streaming in New South Wales (NSW), Australia were explored. This mixed methods research surveyed 30 secondary mathematics teachers. Findings indicated that NSW teachers had experience teaching both mixed-attainment and streamed mathematics classes, however streaming was the prevalent practice. Teachers believed streaming was the ideal method of grouping students in mathematics, allowing for better management of workloads and resulting in less behavioural issues. Teachers also believed that streaming positively impacted the academic outcomes of perceived high-ability students. However, there were mixed findings in teachers' beliefs about the overall impacts of streaming on perceived low-ability students. While, teachers felt that streaming was able to better meet the academic needs of perceived low-ability students, the negative impacts of streaming on the wellbeing of these students was also noted. Overall, we argue that findings indicate that further exploration is needed into ways in which streaming can be made more equitable as it appears to currently be an intractable practice in Australia and other international settings.

Keywords Streaming · Attainment grouping · Ability grouping · Mathematics education · Secondary mathematics · Australia

Introduction

The phenomena of streaming students into class groups by perceived ability in mathematics has been noted as contentious (Forgasz, 2010), and gives rise to several equity concerns (Hallam & Ireson, 2003). Despite this, the practice of streaming seems to be persistent, particularly in secondary mathematics (OECD, 2020). The continuing prevalence of streaming in OECD countries suggests that it must support educationally sound outcomes for students, despite historical evidence suggesting that the "effects of ability grouping on student achievement are essentially zero" (Slavin, 1990, p. 484). Using the PISA 2018

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results, the OECD reported that, on average, 43% of students attended school where classes were grouped by attainment (OECD, 2020). Over 80% of students in the United Kingdom, Israel, Ireland, Brunei Darussalam, Singapore, Hong Kong, United States, New Zealand and Australia were grouped by attainment for some or all their classes (OECD, 2020).

While, the international prevalence of streaming in secondary mathematics is well established, there is limited research into teachers' attitudes (emotions, associations, expectations, and values; Hannula, 2002) towards the practice. This is a notable gap in research given that "the basis of the provision of opportunities to learn lies in the teachers' expectations" (Denessen et al., 2022, p. 2). That is, teachers' attitudes drive student learning opportunities and associated outcomes, something that has been termed a self-fulfilling prophecy effect in literature (Sullivan, 2015). The role that teachers' attitudes play in perpetuating streaming practices is worth further continued exploration given its prevalence internationally despite it a contentious practice for several decades (e.g., Brophy, 1983). Teachers play an important role in mediating the impact of streaming on students given that it has been suggested that the approach teachers' take in addressing student diversity in the classroom is more important than how the students are grouped across classes (Sullivan, 2015).

It is particularly significant to continue building the body of research on streaming in secondary mathematics given that the design of secondary mathematics learning is geared towards streaming through the stratification of mathematics content into separate sets of learning outcomes (e.g., NSW Australia), programs (e.g., Netherlands), or school systems (e.g., Germany). In the specific local context of this study in NSW Australia, the secondary mathematics syllabus is streamed through the stratification of Year 9 and 10 mathematics content into separate sets of outcomes of increasing difficulty (NSW Education Standards Authority (NESA), 2019). The OECD (2023) reports that 58 of the 82 (71%) OECD countries/economies offered two or more distinct educational programmes to 15-year-old students. Therefore, exploration of teacher attitudes towards streaming in the Australian context will be of broader international significance particularly given streaming is a prevalent international practice in secondary mathematics.

Local curriculum context

The NSW Mathematics K-10 Syllabus is a prescriptive document that details the content to be taught from Kindergarten (K) (students aged around 5–6) through to Year 10 (students aged around 15–16). The senior mathematics syllabus then splits into different courses with various foci for Year 11 and 12 (NSW Education Standards Authority (NESA), 2019). In the senior years of schooling, students may choose the mathematics course they wish to undertake, or they may elect to not study mathematics at all. The syllabus from K-10 is divided into staged content from Early Stage 1 through to Stage 5. The Stage 1 to 5 content is expected to be taught in the order of the stages. However, students do not have to achieve every outcome before moving to the next stage (NSW Education Standards Authority (NESA), 2019).

The Stage 5 content, usually taught in Year 9 and 10, is differentiated into three sets of outcomes (5.1, 5.2 and 5.3) that are increasingly difficult. The syllabus itself acknowledges that due to Stage 5 being differentiated into three distinct stages, "many different 'endpoints' are possible" (NSW Education Standards Authority (NESA), 2019, p. 9). The extent to which a student progresses through the Stage 5.1, 5.2, and 5.3 outcomes

influences their options for mathematics subject selection in senior years. Senior subject selection has implications for tertiary study options, as there has been an increase in NSW universities needing a required result in particular senior mathematics courses for entry into specified degrees (Australian Government, 2020).

Though streaming is clearly denoted in the state-based mathematics syllabus in NSW, there no current data that identifies the prevalence of streaming in NSW. However, we will discuss general streaming practices in NSW schools to provide context. The differentiated mathematics syllabus in Year 9 and 10 means that many schools in NSW have streamed their students prior to Year 9, with many electing to start the streaming process from the beginning of secondary school in Year 7 (Jaremus et al., 2020). Streaming decisions are usually undertaken based on students' academic achievement in mathematics. Though majority of NSW schools stream students into 5.1, 5.2 and 5.3 classes, most schools allow for students to move up or down between the streams (usually based on student achievement). However, this movement becomes increasingly difficult as students' progress in age given content gaps can occur that preclude students from entering a "higher" stream. This means that the streaming decisions made as early as Year 7 can have implications for students' tertiary study options given it can be challenging for students to move into higher streams. The closing of opportunities through streaming at an early age is a social justice issue that has been noted in literature (Archer et al., 2018; Connolly et al., 2019; Francis et al., 2020; Jaremus et al., 2020; Slavin, 1990). Given, the limited research exploring streaming practices in Australia and NSW, and it is supposed prevalence, this study is significant for its exploration of how teachers' beliefs drive the persistence of such practices.

Literature review

Streaming terminology

The term streaming is referred to in various ways and has a range of meanings that are dependent on the country in which the practice is being implemented. For example, terminology such as tracking, ability-grouping, attainment-grouping and setting are used in various contexts to denote streaming practices. In Australia, the term streaming is used to describe an array of attainment grouping practices within classes, year groups and subjects, and there are various terms and corresponding definitions internationally. Attainment grouping is often called setting in the United Kingdom or tracking in the United States of America and Europe (Forgasz, 2010). There are distinctions between streaming and setting in England, with streaming referring to the grouping of students across subjects and setting referring to grouping by individual subject (Archer et al., 2018; Connolly et al., 2019; Hallam et al., 2008). In the US, tracking can mean a variety of different structures. Mulkey et al. defines tracking as "the practice of assembling students of roughly equal ability together in classes" (2005, p. 138). There are different types of tracking methods including (1) students of perceived differing abilities going to different schools, as is common in the German school system (Forgasz, 2010), (2) assigning students in the same school to different programs for all subjects, (3) grouping based on ability in a single subject and grade level (Chmielewski et al., 2013; Slavin, 1988, 1990; Sørensen & Hallinan, 1986). Therefore, there is little consistency or clarity in definitions of attainment grouping in international literature, with many definitions referring to a variety of streaming practices. In this article, we define streaming in mathematics as the practice of grouping students into grade

level classes based on their perceived ability (Forgasz, 2010; Hunter et al., 2019; Zevenbergen, 2003).

Student ability and streaming

The stratified nature of streaming is inextricably linked to the acknowledgement that ability in mathematics is quantifiable through teacher observation or formative, summative, or diagnostic assessment. This problematic theme of "ability" is acknowledged by many researchers who often use the phrase "perceived ability" to be able to describe the ranking of students from top to bottom (Connolly et al., 2019; Forgasz, 2010; Hunter et al., 2019; Swanson, 2017). Connolly et al., (2019) and Francis et al. (2020) make the clear distinction that ability grouping is grouping based on academic attainment. Furthermore, Francis et al. (2017) believed that using the phrase ability grouping is confusing the notion that ability is innate and static rather than an ever-evolving construct that is based on prior attainment, wellbeing, social expectations, and background. The simplification of a complex concept has meant that researchers in the field, particularly in the United Kingdom, have referred to ability grouping as attainment grouping (Archer et al., 2018; Connolly et al., 2019; Francis et al., 2017; 2019; 2020; Francome & Hewitt, 2020; Taylor et al., 2017). In agreeance with Francis et al. (2017), in this article we will use the phrase *attainment grouping* to refer to 'ability grouping'. Therefore, the lack of consistent international use of *ability* and *attainment* further highlights the contention that still surrounds the topic of attainment grouping.

The impact of streaming on student outcomes

Hattie (2009) found that on average, over a range of subjects, the effect of attainment grouping on achievement was low. While, this is only a measure of empirical studies, Hattie's findings indicate very little positive effect on achievement when classes are grouped by perceived ability. Boaler et al. (2000) found in a mixed methods study of six schools examining student experiences of attainment grouping in mathematics that the achievement of the students in streamed classes did not reach the expected level given students' prior attainment. In contrast, Mulkey et al. (2005) found that attainment grouping in mathematics did increase the achievement of students. Thus, there is inconclusive and competing evidence on the effect that streaming has on achievement in mathematics.

The movement from student outcomes focusing solely on academic achievement to a holistic view of the student, including their own motivations and self-concepts, has advanced research on attainment grouping. There has been debate about the implementation of attainment grouping and the effect on student outcomes beyond academic achievement (Francis et al., 2017; Johnston & Wildy, 2016). While, Francis et al. (2020) found that there was an increase in self-confidence for students in the 'high' attainment group and a decrease for students in the 'low' attainment groups, Chmielewski et al. (2013) found that high achievers' self-concept was negatively impacted by grouping practices. These contrasting findings highlight the need for further exploration of the impacts of streaming on students' self-conception. While, Mulkey et al. (2005) did find some relationship between achievement and attainment grouping, the authors asked, at what cost? The correlation between academic self-concept and attainment grouping highlights that achievement and psychological wellbeing is at odds (Mulkey et al., 2005).

Social justice and streaming

As the education system moves towards thinking of students as holistic learners, there is also an increase in acknowledgement of institutional bias in schools and the practices that are at odds with social justice. In their 2003 study, Hallam and Ireson explored teacher attitudes towards streaming in the UK. In this large study, Hallam and Ireson looked at the grouping practices of co-educational schools, some with extensive streaming practices. They found that there may be a relationship between teacher attitudes towards perceived low-ability classes and "the alienation of pupils in those groups" (Hallam & Ireson, 2003, p. 344). However, in this study the focus was not specifically on mathematics teachers' attitudes. Furthermore, Archer et al. (2018) explored attainment grouping for English and mathematics, and found that the practice reproduced social inequalities and consolidated power imbalances. Exploring how streaming is tied to the perpetuation of racism in New Zealand, Pomeroy et al. (2023) identified that streaming contributes to emotions of shame and entitlement. Evidence that students from low socio-economic status and minority groups are more likely to be overrepresented in the 'low' attainment groups is seen consistently in research (Archer et al., 2018; Connolly et al., 2019; Francis et al., 2020; Pomeroy et al., 2023; Slavin, 1990).

In addition to the strengthening of power imbalances, students in the 'low' attainment group are more likely to have a teacher with qualifications unrelated to mathematics education (Francis et al., 2019; Prince & O'Connor, 2018). The social justice inequities are further compounded by students' awareness that they are receiving differing pedagogical approaches and lower expectations in the 'low' attainment groups (Francis et al., 2019; Francome & Hewitt, 2020). Thus, given the likelihood of less qualified teachers educating 'lower' attainment groups, the social justice inequities produced by streaming are at odds with any positive effects on achievement.

While, some researchers have found some positive effects of attainment grouping when the pace of the class and the pedagogy were changed suitably (Slavin, 1988), the question is then whether this impedes the potential achievement of students by not allowing them to access all the intended curriculum. Gamoran (2002) discusses the phenomenon of a widening gap of academic knowledge that occurs through attainment grouping that increases over time. However, there is little evidence as to whether this occurs solely due to streaming practices (Linchevski & Kutscher, 1998; Slavin, 1990). A large study conducted by Connolly et al. (2019) highlighted the tension of within school dynamics that can lead to the misallocation of students. Given that students from low socio-economic backgrounds and minority groups are more likely to be misallocated to 'low' attainment groups (Connolly et al., 2019), the resultant shrinking of the curriculum to fit students' perceived abilities further compounds social inequities (Maton & Muller, 2007; Sørensen & Hallinan, 1986). Furthermore, in the context of Australia, the educational gap for Indigenous and non-Indigenous students has been widely reported (Ford, 2013; Miller & Armour, 2021). For example, in the 2019 National Assessment Program—Literacy and Numeracy (NAPLAN), 15.8% of Indigenous students were not meeting the national numeracy standard compared with 3.2% of non-Indigenous students (Australia Curriculum, Assessment and Reporting Authority (ACARA), 2019). While, the impact of streaming on this educational gap has not been investigated, it is important to consider given Connolly et al. (2019) findings. Nevertheless, while students are aware of the changes in pedagogical approaches between the differing attainment groupings, they are not always cognisant of the consequences associated with this.

For example, Boaler et al. (2000) found that students in England were not aware that by being assigned to lower sets meant they could only access a particular grade in future years.

Streaming in Australia

Forgasz (2010) investigated the streaming practices in mathematics in Victoria, Australia, particularly focusing on issues of equity. In the survey of mathematics teachers ($n=44$), it was found that 80% of respondents taught in a school with some form of streaming in 7–10 mathematics, and 74% of the respondents agreed with the streaming policy of their school (Forgasz, 2010). In addition to this, given that student achievement and further advantage in life is linked (Thomson et al., 2016), the stratification of the NSW Mathematics syllabus can create inequitable practices that disadvantage students in 'low' attainment groups (Jaremus et al., 2020). Jaremus et al. (2020) study explored the missed opportunities for students in NSW given the structure of the curriculum, streaming practices, and university prerequisites. They established through the thematic qualitative analysis of interviews with both students and teachers that the streaming practices occurring in NSW were preventing students from realising a career in a STEM-related field from as early as primary school. While, the findings from this study were not readily generalisable to the entirety of NSW, it raised doubts over the equity of attainment grouping and the associated policy concerns. Furthermore, Johnston & Wildy, (2018) explored the conceptualisation of students in streamed classes by teachers. This case study in Western Australia focused on teacher expectations of streamed classes and how this linked to student learning. It found that the way teachers viewed students in streamed classes had a direct link to their expectations of the whole class.

Teacher attitudes towards streaming

Teacher attitudes are based on lived experience (Mensah et al., 2013), therefore different factors will affect a teachers' attitudes towards streaming. According to the literature, factors which can affect teachers' attitudes include the period in which the teacher completed their secondary education, the system or country this occurred in, their own experience as a student with streaming, the time period and institution in which the teacher completed their initial teacher education, their number of years teaching, the socio-economic demographics of their current school, their current school location, or the system(s) in which they have taught in (Dar, 1985; Ernest, 1989; Hallam et al., 2008; Hannula, 2002; Mensah et al., 2013; Zevenbergen, 2005). Based on this range of factors, we consider that teacher attitudes are experiential, and are based on emotions, associations, expectations, and values (Hannula, 2002).

Hannula's (2002) framework of exploring teacher attitudes includes four elements: emotions, associations, expectations, and values. The first characteristic of a teacher's attitude towards mathematics is their own feelings about mathematics, and the second is their beliefs about how mathematics education should occur (Ernest, 1989; Mensah et al., 2013). Furthermore, Dar (1985) found that teacher attitudes were formed on three levels being the social context, school level and teacher level. When discussing the formation of *habitus* in mathematics, Zevenbergen states "mathematics teachers have come to construct particular views of how to best teach mathematics through their participation in the practices of mathematics education" (2005, p. 610). This is further

strengthened by Hunter et al. (2019) who found that the perceptions of a teacher and their own experience of attainment grouping framed their current lens for attainment grouping. Thus, a teacher's attitudes about mathematics streaming could be based on their own experience with attainment grouping, how confident they are teaching mathematics, their enjoyment of mathematics, their position in a school environment and the value they place on mathematics education (Dar, 1985; Ernest, 1989; Hannula, 2002; Mensah et al., 2013; Zevenbergen, 2005).

Some researchers have considered that the attitudes of teachers towards streaming have been amply researched (e.g., Razer et al., 2018). However, Razer et al. (2018) only reported on research from the mid to late twentieth century. Given the advances in thinking about growth mindsets in mathematics education (Boaler et al., 2018; Francome & Hewitt, 2020; Masterson & Koch, 2021), and the impact of teachers on student outcomes (Ker, 2016; Lamb & Fullarton, 2002), research on teacher attitudes conducted over 40 years ago can assist in forming a viewpoint but should be used with caution and not become the basis of any major assumptions. A study into the effects of streaming in primary schools and teachers' beliefs and attitudes that surround this found that teachers believed that streaming was assisting both the perceived high-ability students and the "duller children" (Daniels, 1961, p. 77). While, the language in this article is dated, the findings of the study appear to have been replicated in Chen & Goldring, 1994 study. In this study it was also found that teachers' views about the benefits of diversity in a classroom were often at odds with their positive advocation of attainment grouping (Chen & Goldring, 1994), a finding also noted by Linchevski & Kutscher (1998). However, this research does caution that "the results must be viewed as exploratory and tentative" (Chen & Goldring, 1994, p. 69).

Correlated with the idea that streaming is 'good' for students is the hesitancy that teachers have in implementing mixed-attainment grouping (where classes are not grouped by attainment), particularly in mathematics. During the recruiting period for a study by Taylor et al. (2017) into the factors that deter schools from moving to mixed-attainment grouping, of the 122 mathematics departments that were recruited, only one was willing to participate in the study. In contrast to this, Linchevski and Kutscher (1998) found that experienced teachers were often more positive about the implementation of mixed-attainment grouping than beginning teachers. Thus, there is a lack of clear consistency in the literature about teacher attitudes towards streaming.

Aims and research questions

The aim of this study was to explore secondary mathematics teachers' attitudes towards streaming. To address this aim, the study addressed three key research questions:

1. Do teachers have specific attitudes about the impact of streaming in secondary mathematics for perceived high-ability or low-ability students?
2. How do teachers conceptualise the management of a streamed classroom compared to a mixed-attainment classroom in secondary mathematics?
3. Does a teachers' gender, age, years teaching, schooling experience, teacher education experience, and school system they currently teach in, impact their attitude towards streaming in secondary mathematics education?

Research design

Overview

In this study a mixed methods explanatory design was employed to allow for exploration of a complex phenomenon (Clark & Ivankova, 2016). A questionnaire was administered to secondary mathematics teachers to answer the research questions, and involved both quantitative responses to a series of items to which a Likert-type response format was adopted for each item, and qualitative responses to open ended questions. The qualitative and quantitative data were analysed concurrently to ensure a deeper understanding of the factors that have influenced teacher attitudes towards streaming (Clark & Ivankova, 2016). Furthermore, due to the mixed methods design, data analysis was exploratory to allow for the emergence of themes to evolve throughout the process (Wellington, 2015).

Participants

Participants in this study were recruited from the NSW professional association Facebook page for mathematics teachers. The population of the group was approximately 3900 members at the time of the study, and 30 teachers elected to participant in the study. Appendix 1 outlines the demographics of participants. There were 25 female participants and 5 male participants. As cluster sampling was used in this study (Neuman, 2014), one potential limitation is that it may not yield a sample that is representative of the population (Cohen et al., 2013). When analysing the distribution of female and male respondents and comparing against the 2013 Staff in Australian Schools data (Weldon et al., 2014), the distribution of female respondents was representative of the age distribution of female mathematics teachers across Australia (Weldon et al., 2014).

Data sources

A series of statements (items) with a Likert-type response format for each item and open-ended questionnaire was developed by adapting the 2003 questionnaire employed by Hallam and Ireson (Appendix 2). This questionnaire was designed to measure "teachers' attitudes towards ability grouping and their perceptions of the main problems in teaching ability-grouped and mixed-ability classes" (Hallam & Ireson, 2003, p. 345). Adaptations to the questions were made through the replacement of the term 'setting' with the term 'streaming' to ensure it was appropriate for the Australian context (see Appendix 2 for exact wording adaptations). The ability of the research instrument administered to produce consistent results increases the reliability of the study (Neuman, 2014; Clark & Ivankova, 2016). Thus, the study was strengthened by implementing data sources utilised in a previous study. Using the research instrument produced by Hallam and Ireson (2003), with very few adjustments from the original items, allowed comparison between the data from Hallam and Ireson (2003) to the data from this study. Hallam and Ireson's study had over 1500 participants and collected responses from secondary teachers from a range of subjects. This study, constrained by both time and economics means, had only 30 participants but comparisons could be made given the similar samples of secondary teachers. The questionnaire was self-administered, and the researcher was a non-participant to help minimise social desirability bias (Cohen et al., 2013; Neuman, 2014). The questionnaire was administered on Qualtrics and was completed in approximately 15 min.

Data analysis

The Likert-type response format was analysed using descriptive statistics (Cohen et al., 2013). Each questionnaire item was answered on a 5-point Likert scale from strongly disagree (1) to strongly agree (5). Descriptive statistics were utilised for analysis as inferential statistical analysis would not have been appropriate given the small sample size which may not be representative. Each item was examined to see if there were any trends in responses for particular demographics. The analysis of individual items was then grouped by question category (e.g., findings from questions relating to perceived lower-ability students were grouped) to see if any themes or paradoxes emerged. These groupings were originally based on Hallam and Ireson's (2003) groupings.

The qualitative data were coded to identify patterns using open coding (Cohen et al., 2013). Coding was inductive using an emergent design rather than beginning with predetermined categories, allowing for trends in the data to emerge. The seven open-ended questions were not analysed discretely, rather the collection of written responses from participants were coded and the key themes that emerged are discussed in relevant sections in the findings and discussion. The coding allowed for context to be maintained and helped deepen the thick description that this study aimed for. Furthermore, while a questionnaire cannot find causal relationships, the open coding attempted to find relationships and interactions (Neuman, 2014). Through immersion in the qualitative data, key words, themes, and concepts were able to be categorised and grouped to help gain an overall sense of the attitudes of the teachers towards streaming (Wellington, 2015).

The qualitative data were categorised and broken down into chunks and themes and then analysed alongside the item groupings. This recombining and synthesising of findings (Wellington, 2015) allowed the qualitative data to explain the patterns in the quantitative data. That is, following an explanatory design, the trends in quantitative data were first determined and then the qualitative data was used to explain specific trends and findings further. In this stage, all the findings were then contrasted and compared against the previous literature, seeking any alignment or inconsistencies. When reporting the qualitative data, illustrative examples were chosen to represent the themes in participants' responses. If participants had contrasting responses, these were reported to ensure transparency in findings.

Trustworthiness and validity

To assess the trustworthiness of the interpretations of the qualitative data, Schwandt et al., (2007) outline the criteria for assessing trustworthiness as credibility, transferability, dependability, and confirmability. The credibility of findings was addressed by asking multiple questions on similar themes, and by matching quantitative with qualitative responses to allow for the presence of consensus or contradictions to be identified (Clark & Ivankova, 2016). To maintain transparency and to allow the reader to determine the transferability of findings to other context, participants' demographics and rich description of responses were provided. The third criteria of dependability refers to the ability of the study to be consistent across similar research and participants (Schwandt et al., 2007). The dependability of findings was supported by the detailed description of the research design. In addition, where relevant the data were compared to prior studies. Finally, confirmability outlines the ability of the study to be free of bias from the researcher (Schwandt et al., 2007). Using an

anonymous questionnaire, researcher bias was eliminated from the data collection. While, the researcher will always bring a unique perspective to the data analysis, bias was mediated through the mixed methods design where both the qualitative and quantitative data supported the findings.

The questionnaire is valid for the purposes of this study as it was developed specifically to measure teachers' attitudes towards streaming and their perceptions of the issues associated with the practice, and its internal reliability was previously established (Hallam & Ireson, 2003) for a similar population (secondary teachers). In the present study, the Cronbach alpha statistics for each section of the questionnaire were: able pupils 0.72; personal and social educational outcomes 0.81; equal opportunities 0.82; behavioural 0.71; and beliefs about the effects of different grouping structures on teaching 0.66. Reliability for the scale as a whole was 0.93. Thus, based on Cronbach alpha statistics, the overall internal consistency of the questionnaire was good.

Ethics

The research complied with the University of Sydney Human Research Ethics Committee guidelines and received approval before any participants were approached, asked to sign consent forms, or data were collected. Permission to distribute the survey via Facebook was also gained from the professional organisation, and all participants provided informed consent prior to completing the survey.

Findings and discussion

Teacher attitudes towards streaming

Overall, the findings from this study indicated that teachers surveyed in this study, on average, held the attitude that the ideal way of grouping students in secondary mathematics was by incorporating some type of streaming practice. The findings indicate that 80% ($n=24$) of participants were in favour of grouping students into mathematics classes by perceived ability. While, the respondents discussed different methods of streaming, there was consensus that streaming in some form was the desired model.

When responding to the open-ended questions, it was notable that all respondents referenced perceived student ability in a colloquial and wide-ranging way. The terminology used by teachers included "top students", "lower end", "weaker students", "more capable", "less capable", "the best", "the worst", "high-ability", "low-ability", "more able", "less able", "high achieving", "low achieving", "top end" and "bottom end". This was a direct illustration of the same inconsistency and evolving ideals in the literature internationally (Connolly et al., 2019; Forgasz, 2010; Francis et al., 2017; Hunter et al., 2019; Swanson, 2017). In addition to this, the questionnaire from Hallam and Ireson's (2003) study refers to "brighter children", "less able", "perceived less able" and "lower ability". Use of such language is a potential limitation of the study in terms of encouraging the use of ambiguous terminology relating to perceived ability and attainment. Because of the little unanimity of the terminology in educational research, it is not unexpected that mathematics teachers would also use varied terminology to describe students' mathematical "abilities". It appears that while there is a move from describing ability grouping to attainment grouping in the literature, mathematics teachers have not adopted this terminology. Findings

indicated that they were comfortable that their understanding of "ability" and the labels that they afforded students through the process of streaming were unanimously understood. Such terminology demonstrates a key discord between mathematics teachers and current research in this field.

Overall, 97% of the participants reported that they had taught in a streamed class at some point in their teaching career. This demonstrates that the stratified nature of the NSW mathematics syllabus has allowed schools to implement course streaming. Furthermore, participants made 34 references to the 5.3 "course", 28 to the 5.2 "course", and 24 to the 5.1 "course". While, there is limited data on the predominance of streaming in NSW, the findings from this study demonstrated the prevalence of the practice, though this study reports on responses from a small sample of teachers. However, these findings concur with international literature that indicates that this is a widespread phenomenon (OECD, 2020). While, most participants had taught in a streamed class at some point in their career, 93% also had experience teaching in a mixed-ability class. This is important to note as it strengthens the validity and reliability of the forthcoming analysis as the majority of participants had the necessary experience to comment on the differences between streamed and mixed-ability classes.

Despite the prevalence of streaming, challenges were noted, with one participant highlighting that in streamed classes "you can get locked onto ideas and cannot always meet the correct syllabus outcomes in the right stage". This teacher taught in streamed classes, and, despite the challenges, they believed that the ideal way to group students was through some form of streaming. The flexibility of the syllabus was not felt by this teacher, despite the syllabus specifically detailing that it is "written with the flexibility to enable students to work at different stages in different strands" (NSW Education Standards Authority (NESA), 2019, p. 32). While, this sentiment was reported by one teacher, it alludes to a larger problem of teachers viewing the syllabus as rigid and, if a student is not performing at the same level of their peers, they are a low-attaining student.

The issue of students' self-esteem in a streamed setting was a consequence that many teachers felt strongly about. However, some teachers believed that it had a negative impact, while others believed that streaming did have a positive impact. One stated:

> *I hate it. I can see what it does to the students. The low performing ones stop believing in themselves and give up, the high performing ones feel the pressure to perform and stop taking risks or asking questions. It's horribly damaging to both.*

This was echoed by another participant:

> *I do see some benefits from students being grouped by ability, but the main problem is that it reinforces negative feelings about their ability in maths. I believe everyone can improve and be successful, and if I then turn around and put them in a lower class, I am actually saying what I really think about their potential. I am at a school where discipline isn't a huge problem, so I acknowledge this could be difficult elsewhere. I also think streaming is good for the top few students, but they will be successful in any system. Many in that top class also feel inordinate pressure as well.*

However, another participant felt that it allowed them to introduce content to grow the students' confidence. This participant stated that "I enjoy teaching the low level of mathematics. I like being able to present as much as students need when they are ready—to help them feel successful". Of these participants, the latter two supported streaming practices

in some way. While, it does seem that these participants are in dispute about streaming, in fact, each of these respondents are discussing the self-efficacy of the students. There is some competing evidence surrounding the impact of streaming on student self-efficacy (Chmielewski et al., 2013; Francis et al., 2017; Mulkey et al., 2005), however it appears that teachers in NSW believed that streaming has implications for students' self-efficacy in mathematics.

In this study, it was found that many teachers highlighted student struggle in both mixed-attainment and streamed settings. There was a generally negative overtone when discussing students struggling, with one teacher noting that "the second 5.3 class often struggle with the complexity of the course". It appears from these findings that mathematics teachers are not completely comfortable with the student struggle that occurs in a streamed environment. Discussion of student struggle was not unique to streamed settings as another participant discussed the challenges for perceived low-ability students in a mixed-attainment class. "They struggle with the content and need more support and time than can be afforded in a mixed-ability environment". This statement highlights the tension in a mixed-attainment environment between giving students enough time to learn and ensuring content is covered in the time allocated. Another participant noted that a challenge in a mixed-attainment classroom was that "instructions and explanations often have to be repeated and rephrased". These findings demonstrate teachers' attitude that allowing students to struggle is undesirable. This aligns with Masterson and Koch (2021) who found that the practices of streaming and discussion of traditional assessment were often at odds with growth mindset in mathematics.

Teacher attitudes towards streaming for perceived high-ability students

To answer the first research question and determine teachers' attitudes about the impact of streaming on perceived high-ability students, responses to three questionnaire items were analysed. The findings indicated that, without streaming, teachers on average believed that perceived high-ability students were being neglected academically. As shown in Fig. 1, 19 participants of 30 agreed that bright children were neglected or held back in mixed-attainment classes, and 23 agreed that streaming ensured that brighter children make maximum progress. Most teachers reported that perceived high-ability students were not academically challenged in mixed-attainment classes, and they were ignored due to time lost to the management of poor behaviour. Some responses indicated that there were limited to no challenges teaching a high-attainment class as they "were thirsty for extension work because they got through more due to less time wasted catching kids up in knowledge" and "a top class can be extended with investigative challenges or a key idea, which would leave lower ability learners struggling in a mixed class". Given that the academic effect of streaming on achievement for students is inconclusive, this was a significant finding. While, student achievement and streaming were not explored in this study, teachers' perception of the academic benefits for perceived high-ability students aligns with Mulkey et al.'s (2005) longitudinal study that found that attainment grouping did increase the achievement of students. However, other research such as Hattie (2009), Slavin (1990) and Boaler et al., (2000) found that the effects of attainment grouping on student achievement were low to zero. Some teachers acknowledged that "top classes are intellectually challenging", however, other participants felt that teachers could be become complacent educating the perceived high-ability classes, failing to extend them fully.

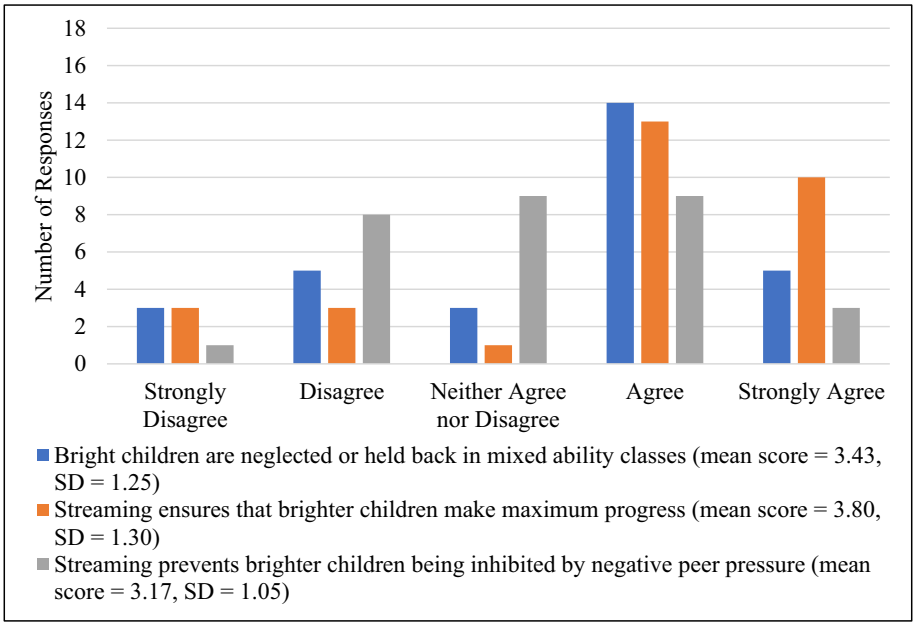

Fig. 1 Summary of responses to the items: bright children are neglected or held back in mixed-ability class, streaming ensures that brighter children make maximum progress, and streaming prevents brighter children being inhibited by negative peer pressure. $n = 30$

Student outcomes are holistic and, while the academic needs of the perceived high-ability students are important, many teachers also discussed the wellbeing of these students. The item "streaming prevents brighter children being inhibited by negative peer pressure" had a median and a mode of 3 (*neither agree nor disagree*). As shown in Fig. 1, eight respondents disagreed with this item and nine agreed, while nine neither agreed nor disagreed. However, some teachers discussed students "at the bottom of the top class" in a perceived high-ability streamed class experiencing low self-esteem. One participant illustrated that students who are classed as "high performing feel pressured to perform, or not make mistakes, or pretend that they understand it all, when they don't". Some teachers reported that the comparison of ability, even within the streamed classes, created feelings of inadequacy and arrogance among perceived high-ability classes. This concurs with the work of Chmielewski et al. (2013) exploring the negative impacts of streaming for perceived high-ability students. However, the findings from this study cannot conclusively determine whether teachers perceived that high-ability students were affected by negative peer pressure.

Teacher attitudes towards streaming for perceived low-ability students

To answer the first research question and determine teachers' attitudes about the impact of streaming on perceived low-ability students, responses to nine questionnaire items were analysed in conjunction with relevant comments in open-ended responses. Overall, teachers had mixed perceptions about the benefits of streaming for perceived low-ability students. There was clear tension in attitudes about the academic outcomes of these students

and their wellbeing. Many teachers believed that they were able to meet the academic needs of the perceived low-ability students, however, were cognisant of the self-esteem issues that could arise in a streamed, low attainment classroom.

When asked whether "streaming enables pupils' curriculum needs to be better matched", 25 participants agreed or strongly agreed (mean score = 4.23, SD = 1.07). This was much higher than the 68.6% of teachers who agreed with this item in Hallam and Ireson (2003) study and could reflect a change in attitudes over the last 20 years in education or the differing study contexts. In the open-ended responses, participants made many references to allowing students access to content at their perceived ability level in both a streamed and mixed-attainment setting. One teacher, who strongly agreed that streaming allowed students' academic needs to be better matched, discussed the changing attitudes of students once they were streamed into a low-attaining class:

> *Lower ability students have outright said to me that they prefer being streamed because they realised that they "aren't dumb" and "there are other people who don't get it too". They say that before being streamed they were too scared to ask questions in class because they felt that their peers already understood the concepts and that it was a "stupid question". Once the students are streamed their teachers are able to spend more time explaining introductory concepts and tailor the syllabus outcomes to their zone of proximal development. Teachers are also able to address critical knowledge gaps from earlier years, particularly underdeveloped number sense from primary school.*

While, a few respondents acknowledged that fostering this change in students' attitudes initially was challenging due to the negative stigma associated with the "low class", some teachers felt they were able to provide greater content support. This supports research reporting that changes to pace and pedagogy had generally positive impacts on student achievement when grouped by attainment (Provus, 1960 as cited in Slavin, 1988). Thus, the benefit of streaming to accommodate curriculum and pacing needs was supported in the findings of this study.

There is a key concern by researchers of the widening gap of academic knowledge and the issues that arise by condensing the curriculum, due to attainment grouping (Gamoran, 2002; Jaremus et al., 2020; Linchevski & Kutscher, 1998; Maton & Muller, 2007; Slavin, 1990; Sørensen & Hallinan, 1986). Some teachers in the study noted that "low-ability classes can become complacent and expect a significantly lower level of work as compared to higher classes". This reflects the findings from Francis et al. (2019) and Francome and Hewitt (2020) concerning students' awareness of the different pedagogical strategies and shrinking of the curriculum. However, teachers in this study did not perceive streaming as an inequitable practice. When responding to the item, "mixed-ability grouping gives each child a fair chance", over 63% disagreed. For perceived low-ability students, streaming may mean that adjustments need to be made to the curriculum to meet the academic needs of the students, which can result in a gap in academic knowledge (Gamoran, 2002). However, teachers in this study still responded that the alternative, mixed-attainment grouping was not a fair practice. Thus, while some teachers were aware of the issue of low-attaining classes expecting to receive less work, the possible inequities resulting from streaming were not acknowledge by most participants.

Despite most teachers agreeing that streaming was beneficial in meeting perceived lower ability students' academic needs, the small number of participants who disagreed noted the consequences of inflexibility between streams. One teacher highlighted that there are:

> *Many issues with the kids in lower classes—you are locking them out of a chance of success at a young age. They may mature late or things just haven't "clicked" for them yet. Once in a lower class they get left behind the upper classes and chances of transferring up get smaller for lots of reasons. I have a huge issue with this.*

This participant was not in favour of streaming as an ideal practice, however, taught in streamed classes. In contrast to this, another teacher noted that they were "really excited for the re streaming mid-year at our school to see how that pushes some into year 10 and then into their year 11 choice". This teacher was discussing the movement of Year 9 students between classes based on their assessment results during the year and how this will then eventually affect their senior mathematics subject choices. Jaremus et al. (2020) discussed the situation where students are forced out of STEM-related careers as early as primary school. The teacher's response framed the equity issues of streaming in a positive light when movement between streams is possible. Overall, it is notable that there were only a small number of participants who acknowledged the academic inequities of streaming, as discussed in other literature (e.g., Jaremus et al., 2020).

Though potential academic inequalities caused by streaming were rarely noted by participants, the wellbeing disadvantages for perceived low-ability students were highlighted in this study. Teachers discussed these disadvantages citing that "students can be found to be stuck in an endless cycle of negative perceptions", "low students struggle with the idea they are the 'dumb' class", "students not in the top set can feel judged" and the "poor self-efficacy of students in the lower ability classes". Figure 2 shows the number of responses to items regarding student self-confidence and the effects of different kinds of attainment grouping. In Fig. 2, the frequencies of each response for the eight questions are centred on the means for comparison purposes. Half of teachers believed that streaming had a damaging effect on the self-esteem of those in low-attaining classes, and 17% neither agreed nor disagreed. However, 53% of teachers believed that perceived low-ability children compared themselves unfavourably to other students in mixed-attainment classes. Furthermore, 47% of teachers believed that streaming children stigmatised those perceived as low-ability, with 20% neither agreeing nor disagreeing. This indicated that teachers believed that, regardless

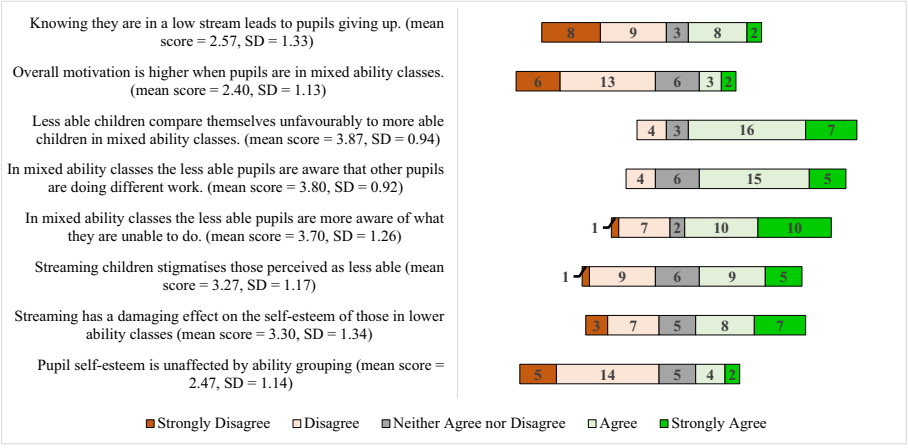

Fig. 2 Response frequency to items regarding student self-confidence and the effects of different kinds of ability grouping

of whether it is a streamed or mixed-attainment classroom, perceived low-ability students are at a disadvantage in relation to their wellbeing. Overall, the teachers in this study were able to justify why streaming was potentially academically beneficial to perceived low-ability students, but there was a sense across the sample that streaming had more drawbacks for perceived lower ability students, compared to the perceived high-ability students.

Teacher capability to manage streamed or mixed-attainment classes

To answer the second research question and determine teacher attitudes towards the management of streamed versus mixed-ability classes, responses to four questionnaire items were analysed, as well as relevant comments from the open-ended questions. Overall, it was found that teachers believed it was easier to manage a streamed class.

A teacher can develop attitudes based on their experiences in the profession (Dar, 1985). Thus, their attitudes towards streaming can be impacted by the workload surrounding the practice. When asked "teaching is easier for the teacher when the classes are streamed", 22 respondents agreed or strongly agreed with the statement, six respondents disagreed, and two neither agreed nor disagreed (mean = 3.73, SD = 1.01). When discussing the challenges of teaching a streamed class verses a mixed-attainment class, many teachers cited that a mixed-attainment class presented a greater amount of lesson preparation, and it was generally more challenging due to the wide-ranging perceived ability levels. Furthermore, they discussed the frustration of managing their own time when trying to understand and plan for the individual needs in the class.

Taylor et al. (2017) found that teachers believed that streaming was easier in terms of lesson preparation, and teachers feared that mixed-attainment teaching would add to their workload. Thus, the findings of this study align with Taylor et al. (2017) as it was found that teachers' generally feel that teaching a streamed class allowed a more manageable workload. Although respondents indicated that they were able to manage the preparation workload of a streamed class with more ease, some teachers did not feel that it was necessarily easier to teach a streamed class with one stating that it was "easy if you have a top group, challenging if you have lower groups".

Respondents noted that a class will always have varying levels of attainment, even within a streamed environment. However, many participants indicated that the reduction in the range of perceived student ability in a streamed environment was beneficial for teaching, with one teacher noting, "I enjoy teaching streamed classes in the sense that I'm able to do a better job of differentiation (dealing with a spread of 2–3 years in student learning vs 6–8 years in student learning)". The large gap in student attainment is echoed in the research about students in Australia, particularly the achievement gap between Indigenous and non-Indigenous students (Australia Curriculum, Assessment and Reporting Authority (ACARA), 2019; Ford, 2013; Miller & Armour, 2021). While, teachers found that this gap was reduced in a streamed classroom, many teachers highlighted that though "it is easier to pitch work at a suitable level for students in a streamed class", there was still a need to differentiate. Furthermore, 80% of teachers either disagreed or strongly disagreed with the item, "streaming leads to teachers ignoring the fact that a class always contains a range of abilities", illustrating an awareness of differing ability levels in a streamed classroom through both the quantitative and qualitative data.

Findings also revealed that teachers on average believed that, in a mixed-attainment class, the teacher tended to teach to the average child (Fig. 3). This suggests that there was a belief that differentiation practices are poor in mixed-attainment classes. The qualitative

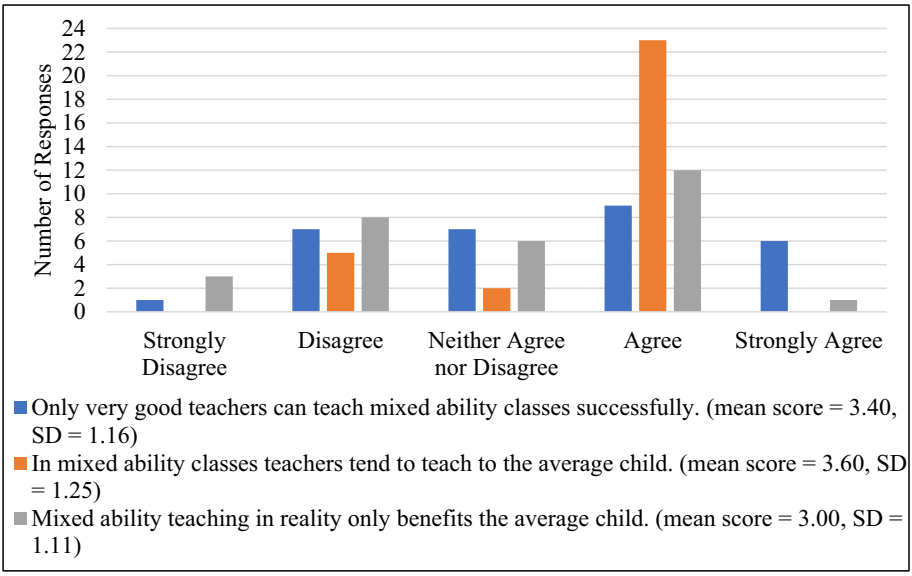

Fig. 3 Summary of responses to the items: only very good teachers can teach mixed-ability classes successfully, in mixed-ability classes teachers tend to teach to the average child, and mixed-ability teaching in reality only benefits the average child. $n = 30$

data suggested that this may be because of the larger workload needed to support the range of attainment levels. There was little consensus over whether only very good teachers could teach mixed-attainment classes successfully, with 50% responding in agreeance. Furthermore, for the benefits to the "average" child in a mixed-attainment class, which some educators may argue does not exist, it was found that teachers did not believe that mixed-attainment grouping could create this benefit. The findings suggested strong alignment of views that streaming allowed teachers to cater to the needs of all students, and that mixed-attainment teaching did not do this.

While, there was mostly consensus that streaming reduces teachers' workloads, many responses indicated that there were still behaviour management issues in streamed settings. The findings outlined in Fig. 4 demonstrate majority agreement with the item "streaming makes classroom management easier", it also shows that teachers somewhat agreed that there are more discipline problems in perceived low-ability classes and in mixed-attainment classes. Many teachers discussed the issue of discipline in a mixed-attainment classroom, citing that this was not just an issue for perceived low-ability students, but often for perceived high-ability students as well. One noted that they had a:

> *Terrible experience and made me hate teaching the class. The behaviour was a constant problem. I exhausted myself and my love of teaching trying everything to no avail. Lots of high achieving students told their parents of the crap that went on and many left the school for other schools because of it.*

Some respondents highlighted that setting expectations and classroom routines were important to help mitigate discipline problems. A teacher noted that "the lower streamed classes may exhibit more challenging behaviour due to a culture of poor attitudes towards

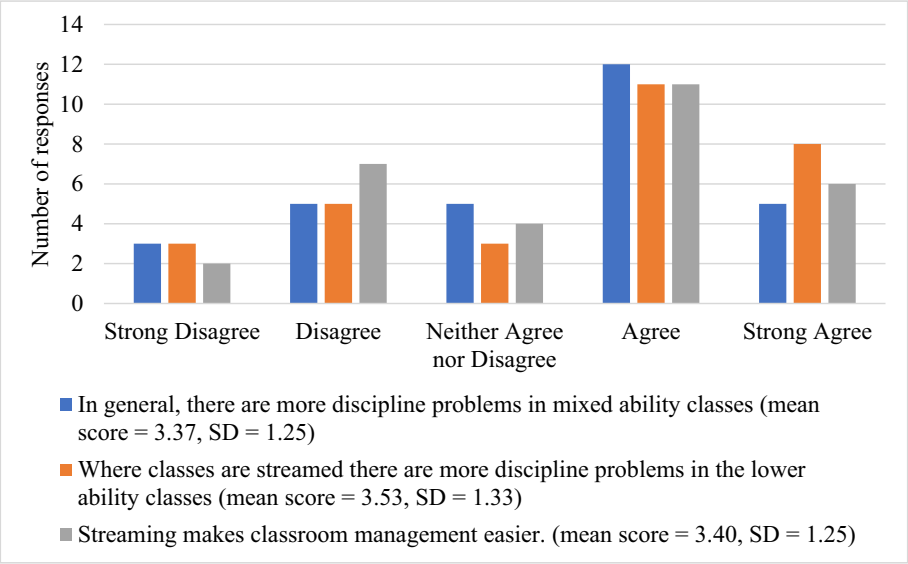

Fig. 4 Summary of responses to items regarding classroom management and discipline

mathematics and previous disengagement. This is why it is important to stream early before these occur". It was noted that this poor behaviour may be because of a lack of positive peer role modelling in lower attainment groups (Johnston & Wildy, 2016). It is an important finding that teachers believed that lower streamed classes exhibited a higher rate of poor behaviour and disengagement. This negative conceptualisation of the perceived lower-ability classes by teachers was explored by Johnston and Wildy (2018), and these conceptions can be seen in the findings of this study.

Teachers' experience and how this impacts their attitudes towards streaming

To answer the third research question, participants responses were analysed to determine whether gender, age, years teaching, schooling experience, teacher education experience, and school system had an impact on their attitudes towards streaming. Responses to the demographic items on the questionnaire, as well as response to the open-ended questions where participants describe their own experiences with streaming and mixed-ability classes were specifically analysed to answer this research question. It was found that, generally, teachers' backgrounds and experiences did not impact their attitudes towards streaming.

A teacher can develop and change their attitudes over time through their participation in education (Zevenbergen, 2005). In 2020, the OECD reported that over 80% of students in Australia were streamed in some form. Of the teachers in this study, nearly 87% were streamed in secondary school. It appears that streaming was prevalent in the school experience of the majority of participants despite a vast array of ages. Many teachers had positive recollections of being streamed and noted "it was valuable for me", "I enjoyed it", it was "really good", "I was always placed in one of the top classes and enjoyed being with students who were academically oriented", and "there were minimal disruptions because of it". Only one teacher discussed a negative experience with streaming. They stated, "The

only test I failed at school was after I was put in the lowest streamed class after changing schools". This respondent was also in favour of streaming by creating a "top set, bottom set, mixed in the middle". Of the three respondents who did not believe that a form of streaming was the ideal method of grouping students in mathematics, two were not streamed in secondary school.

The teachers in this study began their initial teacher education ranging from 1979 to 2019 and completed their university experience in Australia. In this study, it was found that 25 respondents answered in agreeance to the item "I feel confident differentiating in a mixed-ability classroom". Three participants disagreed or strongly disagreed, and two neither agreed nor disagreed with the statement. When describing their experience learning about differentiation at university, teachers stated that the concept was discussed but there was "little practical or applicable instruction on how to differentiate effectively in different environments". Furthermore, one respondent with 16 years teaching experience felt confident in differentiating in a mixed-attainment classroom, however, stated "it is a waste of time trying to differentiate content in maths". Another respondent who reported strong agreement to their confidence in differentiating in a mixed-attainment classroom stated that "I never feel I do it [differentiation] well". Thus, while teachers were aware of what differentiation is, they generally lacked confidence in differentiating or did not appreciate that it was worthwhile.

For this study, the findings indicated that there were no trends in participants number of years teaching or the system that the teacher was current teaching in and their attitude towards streaming. Similarly, there were no trends in the teacher's age, whether they taught in a single-sex or co-educational setting, or the location the teacher was teaching (either rural or metropolitan) and their attitude towards streaming. Given the small representativeness of males in the sample ($n=5$), there was no conclusive evidence on whether gender impacted a teacher's attitude towards streaming. These findings are significant given that Hallam and Ireson (2003) found that total time spent teaching and differences in school demographics impacted on teacher attitudes.

Conclusion and implications

A key finding from this study was that teachers mostly felt that they were able to structure their lessons and content to better suit the academic needs of the students when classes were streamed, but there were negative impacts on students' wellbeing. An implication that is applicable to contexts beyond Australia is that there needs to be acknowledgement of, and planning for the management of the wellbeing challenges that arise from streaming practices for all students. This is particularly important given that it was found in this study that teachers considered neither mixed attainment grouping nor streaming was preferable for supporting students' wellbeing. That is, teachers considered that the wellbeing outcomes of students were negatively affected by the inflexibility of streams. Given the prevalence of streaming in Australia and internationally, there should be rumination about flexibility and an aim to have fewer rigid structures in place when grouping students into mathematics classes. When grouping students, schools have an obligation to explore what will work best for their students and teachers, rather than following the status quo.

While, most surveyed teachers believed that they were matching the curriculum needs of their students through streaming, the frequent mention of distinct "courses" of study has implications for the way in which academic needs are catered for within a streamed setting.

The phenomenon of streaming causing a shrinking of the curriculum and widening the gap of academic knowledge has been highlighted in literature beyond the Australian context as an inequitable consequence of streaming (Gamoran, 2002). In the local context of this study, the NSW Mathematics Syllabus was written as a continuum, with flexibility of content a key feature. Contrary to syllabus recommendations, through rigid streaming practices, students may be being forced into an inflexible structure that could possibly impact their future career choices (Jaremus et al., 2020). The shrinking or narrowing of the curriculum as a result of streaming is a significant consequence that should be of concern to countries that prevalently stream mathematics classes. Given that students from disadvantaged backgrounds and social minorities are more likely to be misallocated to lower attainment groups (Connolly et al., 2019; Maton & Muller, 2007; Sørensen & Hallinan, 1986), the impact of streaming could further compound social inequities and continue a cycle of poverty in a student's life. Overall, teachers believed that neither streaming, as it is currently conceptualised, nor mixed-attainment grouping are completely effective at meeting all students' needs. As schools are a unique ecosystem, each with different cultures, personalities, and historical structures, they can tailor their practices to ensure that the needs of students are met in an equitable way.

There are some limitations in this study that effect the generalisability of findings. Firstly, the study had 30 participants. The population of this research was any teacher who had taught secondary mathematics in NSW in the period from 2016 to 2020 inclusive, thus this study is limited in its generalisability as the sample ($n = 30$) is small. However, given the respondents were of varying ages, gender, location and school system, some generalisability can be claimed. Due to the nature of this study, time, and money, the sampling of this population was only feasible through the professional association Facebook page. For future research, a random sampling method using the NSW Education Standards Authority list of accredited mathematics teachers would be suggested. A second limitation of the study was that it did not necessarily seek out the opinions of teachers who had taught mathematics while having qualifications in another field. This is a key demographic in NSW and would provide insightful information about how they view streaming. Furthermore, this study does not take into consideration the perspectives of school administrators, for which streaming may have specific administrative and organisational implications. A third limitation to note is a potential confirmation bias as streaming in mathematics is a prevalent practice in NSW schools across all settings. Therefore, there is the potential that the participants are entrenched in a "culture" of streaming where it is difficult to imagine the logistics of organising the grouping of mathematics classes in any other way and this may have shaped their attitudes.

While, this study has explored teachers' attitudes towards streaming, it must be noted that their perception is not always the truth for every participant in the mathematics classroom. Streaming is a particularly contentious in mathematics education and can be a polarising issue for both teachers and students. The findings from this study pertain to the beliefs and attitudes of mathematics teachers and therefore, cannot be generalised to the reality of the classroom as students may have conceptualised the phenomenon of streaming in a different way. Finally, the ambiguity of the language surrounding ability in the questionnaire is a limitation of the study. While, it is reflective of the common usage of the terminology, this should be consolidated and aligned to literature when using this questionnaire in future research.

The prevalence of streaming in NSW is not something that is likely to change given the support from teachers as shown in this study. However, there are opportunities to enhance streaming practices that could be explored with further research. A key finding from this

study was that despite completing secondary school and university at differing times, teaching in different school systems and locations, and having different lengths of experience teaching mathematics, there was no correlation between these demographics and whether a teacher thought that streaming was ideal in mathematics. Thus, more research needs to be conducted into why this is the case. Is there a particular type of person, in terms of beliefs and attitudes towards mathematics, education and streaming, who becomes a mathematics teacher?

The concept of ability, while spoken about consistently and abundantly in research, education, and this study, is a complex concept. The prevalence to which it is referred to in literature and the findings of this study suggests that there is consensus on what ability is, however, it is far from a foregone conclusion. Therefore, further research into how teachers' view student ability should be conducted. In particular for mathematics education, further research on how teachers' attitudes about perceived ability affect their pedagogy and praxis would contribute to obtaining a better understanding of how a teachers' attitudes towards streaming are formed. For example, there are likely pedagogical implications of the finding that many teachers felt that the academic needs of the high-attaining students were being held back by the low-attaining students in a mixed-attainment classroom. Furthermore, teachers believed that neither streaming nor mixed-attainment classrooms were meeting the wellbeing needs of the low-attaining students. Thus, given that the low-attaining students are seemingly 'losing out' in either scenario, more research needs to be conducted into what practices are ideal for these students.

In Australia, there is a lack of research into streaming and its effects. Given that streaming has been found to have negative social justice implications in the United States and United Kingdom, including students from low-socio-economic backgrounds being misallocated and overrepresented in low streams (Archer et al., 2018; Connolly et al., 2019; Francis et al., 2020; Slavin, 1990), it would be prudent for future research to investigate whether this is the case in Australia. This is specifically important given the educational gap for Aboriginal and Torres Strait Islander children in mathematics (Miller & Armour, 2021). While, the gap in achievement has been noted to exist from the early years of primary school, it would be worthwhile exploring whether streaming in secondary school positively or negatively impacts this gap for Aboriginal and Torres Strait Islander children.

Finally, it is rarely classroom mathematics teachers who are making the decision to stream students. These decisions are often made at a much higher point in the school ecosystem and include views from other stakeholders such as parents and the executive of a school. Thus, further research into how streaming occurs in NSW classrooms and the factors that impact the placement of children would be enlightening. Given the historically charged curriculum and the current structures in place in NSW, further research into the current systems in place at schools and the challenges that come with this would allow those who oversee the organisation to make informed and evidence-based decisions.

When Mulkey et al. (2005) discussed the benefits of streaming, their key question was 'at what cost?'. There seems to be a cognitive dissonance from the teachers in this study. On one hand, they were able to clearly articulate the benefits of a streamed classroom, and on the other hand they were able to identify the negatives of streaming, including social justice implications and poor wellbeing outcomes. It is clear in this study that the consensus of mathematics teachers on the advantage of streaming has been formed and moulded well before they enter the classroom, given that age, gender, school system, type and location and years teaching have little to no impact on their attitude towards the practice. The prevalence of streaming and mathematics teachers' comfortability with the phenomenon suggests that educational research needs to make the best of the situation and

aim to explore the most equitable way of implementing the practice that attempts to avoid the wellbeing disadvantages and the social inequities that arise. Therefore, if the cost of streaming is the wellbeing of students and the narrowing of career choices from a young age, is streaming in mathematics worth it?

Appendix 1

See Tables 1, 2 and 3.

Table 1 Demographics of survey participants. $N = 30$

	N	%
Gender		
Female	25	83.33
Male	5	16.67
Age		
25–29	5	16.67
30–34	5	16.67
35–39	0	0.00
40–44	1	3.33
45–49	9	30.00
50–54	6	20.00
55–59	1	3.33
60–64	3	10.00
Nationality		
Australian	28	93.33
Chinese (Hong Kong)	1	3.33
Australian and British	1	3.33

Table 2 Participants' current school information. $N = 30$

	N	%
School system		
Government	16	53.33
Independent	9	30.00
Catholic systemic	5	16.67
School type		
Co-educational	20	66.67
Single-sex (boys)	7	23.33
Single-sex (girls)	3	10.00
School location		
Metropolitan	20	66.67
Rural	10	33.33
Number of students		
500 or less	2	6.67
More than 500 and 900 or less	14	46.67
More than 900	14	46.67

Table 3 Participants' school, university, and teaching experience. $N = 30$

	N	%
Country majority of secondary school completed		
Australia	28	93.33
Lebanon	1	3.33
United Kingdom	1	3.33
Decade majority of secondary school completed		
1970	4	13.33
1980	14	46.67
1990	2	6.67
2000	7	23.33
2010	3	10.00
Year in which initial teacher education began		
1975–1979	1	3.33
1980–1984	2	6.67
1985–1989	1	3.33
1990–1994	2	6.67
1995–1999	1	3.33
2000–2004	3	10.00
2005–2009	6	20.00
2010–2014	9	30.00
2015–2019	5	16.67
Number of years teaching		
0–4	8	26.67
5–9	6	20.00
10–14	5	16.67
15–19	4	13.33
20–24	0	0.00
25–29	3	10.00
30–34	1	3.33
35–39	2	6.67
40–45	1	3.33

Appendix 2

Questionnaire

All words that appear in italics have been changed from the original Hallam and Ireson (2003) questionnaire. The word setting in the original questionnaire was replaced by the word streaming for the Australian context.

See Tables 4 and 5.

Table 4 Please read each one and indicate to what extent you agree or disagree with each statement. Likert-type response questions: Below are a number of statements that relate to streaming in secondary mathematics. (This will use a five-point Likert Scale, strongly disagree, disagree, neutral, agree, strongly agree)

Item	*Question*
Able children	
1	Bright children are neglected or held back in mixed-ability classes
2	Streaming ensures that brighter children make maximum progress
3	*Streaming* prevents brighter children being inhibited by negative peer pressure
Personal and social educational outcomes	
4	Pupil self-esteem is unaffected by ability grouping
5	*Streaming* has a damaging effect on the self-esteem of those in lower ability classes
6	*Streaming* children stigmatises those perceived as less able
7	In mixed-ability classes the less able pupils are more aware of what they are unable to do
8	In mixed-ability classes the less able pupils are aware that other pupils are doing different work
9	Less able children compare themselves unfavourably to more able children in mixed-ability classes
10	Overall motivation is higher when pupils are in mixed-ability classes
11	Knowing they are in a low set leads to pupils giving up
Equal opportunities	
12	*Streaming* benefits the more able pupils at the expense of the less able
13	Mixed-ability grouping gives each child a fair chance
14	Mixed-ability teaching in reality only benefits the average child
15	Mixed-ability classes provide the less able pupils with positive models of achievement
16	Mixed-ability teaching benefits the less able pupils academically at the expense of the more able
Behaviour	
17	In general, there are more discipline problems in mixed-ability classes
18	Where classes are *streamed* there are more discipline problems in the lower ability classes
19	*Streaming* leads to teachers ignoring the fact that a class always contains a range of abilities
Beliefs about the effects of different grouping structures on teaching	
20	Only very good teachers can teach mixed-ability classes successfully
21	Teaching is easier for the teacher when the classes are *streamed*
22	In mixed-ability classes teachers tend to teach to the average child
23	*Streaming* makes classroom management easier
24	*Streaming* enables pupils' curriculum needs to be better matched

Table 4 (continued)

Item	*Question*
25	I feel confident differentiating lesson content in a mixed-ability class

Table 5 Open ended questions: please answer the following questions in relation to streaming in a mathematics classroom in NSW

26	Describe the current structure and methods of grouping students in mathematics classes at your school
27	Describe your experience teaching streamed mathematics classes in NSW
28	Describe your experience teaching mixed-ability classes in NSW
29	What are some of the challenges teaching mixed-ability mathematics classes?
30	What are some of the challenges teaching streamed mathematics classes?
31	Describe your initial teacher education in regard to differentiation
32	What would be your ideal method of grouping students in mathematics classes in NSW?

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Declarations

Conflict of interest Not applicable

Ethical approval Ethics approval gained from the University of Sydney Human Research Ethics Committee (Ref No. 2021/417).

Informed consent Informed consent was gained from all student participants in line with the ethical approval.

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