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Streaming for Mathematics in Years 7-10 in Victoria: An Issue of Equity?

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Streaming for mathematics remains a contentious issue and particular forms of the practice have been considered inequitable. In the study reported here, the focus was on the extent to which streaming is used for mathematics at years 7-10 in Victorian secondary schools. Also of interest were the forms of streaming adopted and the criteria for selection into class groups; and teachers' views on streaming, their beliefs on whether all students benefit equitably from the practices adopted, and if they modify the curriculum and/or pedagogy in streamed classes. The findings indicated that forms of streaming were fairly widespread, were supported by many mathematics teachers, and were more prevalent as year level increased. Curriculum differentiation and pedagogical change that appeared to support high achievers, but which might limit low achievers' future mathematics options, were reported. Some teachers recognised some of the limitations associated with streaming, and that particular students might be disadvantaged as a result. The teachers participating in the study did not identify students' gender, socioeconomic, or ethnic/Indigenous backgrounds as factors of disadvantage linked to streaming. The implications of the findings and recommendations for future research are discussed.

Streaming (or within-grade-level grouping by perceived *ability*) for mathematics learning[2] is a contentious issue and research findings are inconclusive with respect to the benefits for all students. From time to time, heated debates on the practice are also reignited in the public domain, influencing the views of the general public. However, the complex of factors that are known to interact and affect learning outcomes are often obscured by simplistic media reporting. As a result, a bipolarity appears to have been established. Strongly held views are put forward with little, or selective, reference to the research findings, with scant concern for the potential limitations on the future educational and life options of some students. Not much appears to have changed since Reisman and Kauffman (1980) noted that:

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[2] In the UK, streaming (as defined above) is known as setting; in the USA, the term track is used. In Europe, however, tracking is a term used for differing-ability schools with different curricular offerings (e.g., Austria, Germany) – see Hanushek and Wößmann, 2005 – as opposed to having "comprehensive" schools (e.g., Australia, UK, Japan).

> In our culture, mathematics is considered to be a powerful tool. Successful performance in mathematics carries with it positive connotations. Being "good in math" is "being bright", and being bright in mathematics is associated with control, mastery, quick understanding, [and] leadership. Unsuccessful mathematics achievement implies the opposite of these positive connotations. This value system is a cultural problem that has a subtle harmful effect on a number of children and adults. (p. 36)

In Australia, the terms *streaming* and *ability grouping* are often used synonymously. However, the Senate inquiry into *The Education of Gifted and Talented Children*[3] (Commonwealth of Australia, 2001) differentiated the terms. It was noted that "... ability grouping for the gifted is not the same as streaming the whole year group into A, B, C, D... classes" (p. 67), and that general streaming (of the whole year group for all subjects) was undesirable "because of perceived detriments to the less able" (p. 67). It was claimed that the gifted could be catered for in a variety of ways without streaming whole year groups. The inquiry's view was that "excellence and equity are not in conflict" (p. 78) and that "the curriculum needs to be differentiated for gifted children, and this applies whether teaching is done in an ability grouped setting or in the comprehensive classroom" (p. 78).

Despite the differences in the definitions noted in the senate inquiry report, it was evident in the responses from the teachers participating in the study reported here that they did not clearly distinguish the terms. *Streaming* and *ability grouping* were used loosely and interchangeably, and the practice of grouping for mathematics at any given secondary year level was found to take various forms including: selecting out only high achievers or only *at risk* students; grouping into *top/high*, *medium/mixed*, and *low/at risk* achieving classes; having more than three *streams* (i.e., like the A, B, C, D... classes considered undesirable by the Senate inquiry); and the use of *ability groups* within *mixed ability* (or heterogeneous) classes. In this article, the term *streaming* is used to "describe the practice where students of perceived similar achievement levels are placed in the same classroom" (Zevenbergen, 2003, p. 2).

Teachers' beliefs and practices about streaming are particularly important in today's context. Prior to and including 2008 (the year this study was conducted), the responsibility for the development, implementation, and assessment of mathematics curricula rested with each Australian state/territory. In April 2008, the National Curriculum Board was

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[3] The concern was with children of 'high intellectual or creative ability' (Commonwealth of Australia, 2001, p. 34). It was stated that it should be clear in policy that "special needs (giftedness) should be seen in the same light as special needs (intellectual disabilities) or special needs (physical disabilities)" (p. 34).

established to deliver "Australia's first ever national curriculum" (Gillard, 2008). In the initial advice about the national mathematics curriculum, there was a strongly worded statement consistent with social justice and educational equity principles against the temptation to "cater for the spread of achievement by differentiating opportunities" (National Curriculum Board, 2008, p. 6). It was argued that there should be no barriers to progression in mathematics and that "students should have the opportunity to choose any mathematics study at the start of year 10, and should not have their options restricted by their own previous choices or their school's structuring of subject offerings" (p. 6). Opposition to forms of streaming limiting students' choices of mathematics options at year 10 and beyond can be inferred from these statements. Thus, it is important to know what impediments to keeping open students' choice of mathematics subject at year 10 may currently exist in school grouping practices and related teacher beliefs. When the national curriculum is implemented, will schools be challenged to modify their current grouping practices in order to ensure that a full range of mathematics curricular choices are available to all students?

The study reported here was conducted in the state of Victoria, but the findings have implications nationally and beyond.

Context of the Study

Victoria, Australia, is the second most populous state in Australia. Schools have considerable autonomy in the ways students can be grouped for learning. In 2008, there was a state-decreed mathematics curriculum, the *Victorian Essential Leaning Standards* [VELS], that schools were expected to follow, and only expected mathematics content and outcomes for pairs of year levels are outlined (e.g., the curriculum for years 7 and 8 are considered together under "Level 5").

As elsewhere in Australia, Victoria has experienced a critical shortage of qualified mathematics teachers (Mathematical Association of Victoria [MAV], n.d.; Topsfield, 2008) for some time. To cope with the crisis, many who have been required to teach secondary level mathematics, particularly in the early years of high school, have been teaching out of field (MAV, n.d; Topsfield, 2008), that is, they are qualified teachers but lack content knowledge and have not attended pre-service courses focussing on mathematics teaching.

Across Australia there are three educational sectors: the government sector, which is publicly funded; the Catholic sector, with generally low tuition fees and government subsidies; and the Independent sector in which each school is privately run (often involving some religious authority), with generally high tuition fees and government subsidies. In Victoria, the vast majority of government schools are coeducational. Among the Catholic and Independent schools, several are single-sex. Overall, there are more single-sex schools for girls than for boys in Victoria, leaving some coeducational schools with a majority of boys. The break-up of Victoria's 561 secondary and primary/secondary schools (latest data at the time of writing) by educational sector, region (metropolitan Melbourne, or non-metropolitan), and gender composition, is shown in Table 1. Also shown is the break-up of the 44 schools from which data were gathered in this study.

Table 1
Schools in Victoria (2007) and Schools in the Present Study by Educational Sector, Gender Mix, and Location

	Victorian schools: N=561		Schools in the study: N=44	
	N	%	N	%
Government	308	55%	19	43%
Catholic	99	18%	14	32%
Independent	154	28%	10	23%
No response			1	2%
Single-sex boys schools [SSB]	27	5%	0	0%
Single-sex girls schools [SSG]	50	9%	10	23%
Coeducational schools [Coed]	484	86%	31	70%
Other/no response			3	7%
Metropolitan [Met]	343	61%	28	64%
Non-metropolitan [NMet]	218	39%	15	34%
No response			1	2%

Data source: Department of Education and Early Childhood Development (2007). *Summary statistics Victorian schools*. Melbourne: Author.

It should be noted that there was no predetermined sampling procedure adopted in this study. Data were gathered via an online survey with a link from the website of the Mathematical Association of Victoria, the professional association for mathematics teachers in Victoria, inviting secondary mathematics teachers to participate and provide information about the schools in which they worked. As can be seen in Table 1, the schools from which information was obtained covered most types of Victorian schools.

The Victorian Mathematics Curriculum

Mathematics is taught as an integrated subject at grades 7-10, that is, the curriculum is comprised of content covering number, algebra, geometry, and probability and statistics. Problem solving and technology use are also integral components of the mathematics curriculum at each grade level. Students choose among the differentiated subject offered at grades 11 and 12 as part of the 2-year Victorian Certificate of Education [VCE] – see Victorian Curriculum and Assessment Authority (2005) for details on these subjects and the combinations of subjects that can be studied. It should be noted that some of these mathematics subjects serve as prerequisites for some tertiary-level courses.

Victorian Guidelines on Streaming/Ability Grouping

In the 1980s, the message was clear in Victoria that streaming was unacceptable. In *AdVise*, the newsletter of the Victorian Institute of Secondary Education [VISE], the curriculum authority of the time, it was stated that:

> [S]treaming and setting, if we are to believe the research, are unsound educational practices and all educators should strive to minimise, and eventually remove, their influence so that schooling recognises and promotes the gifts all young people have. (Emmett, 1983, p. 3)

In 2008, however, the Victorian Department of Education and Early Childhood Development [DEECD] did not appear to have clear guidelines on streaming. Nevertheless, in its guidelines for addressing the needs of gifted students (for which definitions were provided) (DEECD, n.d. a), differentiating the curriculum was seen as integral to a school's curricular strategy to afford opportunities for students to reach their full potential, and the regular classroom was considered the venue to provide appropriate challenges to meet the needs of the majority (DEECD, n.d. b). A range of school options, consistent with the recommendations of the Senate inquiry (Commonwealth of Australia, 2001), were put forward to cater for gifted students (DEECD, n.d. c). Despite the clear emphasis in these documents being on provisions for gifted students, those seeking support for a variety of forms of streaming could selectively choose among the statements and research cited on the DEECD website on the gifted (e.g., DEECD, n.d. d) to mount a case.

Previous Research

A large body of previous research on *streaming/setting* (within-grade-level grouping by perceived *ability*) for mathematics learning in secondary schools, tracking (differing-ability schools – see Hanushek and Wößmann, 2005), as well as related equity implications, served to guide the development of the online survey questionnaire items (described below) that were used in this study. The focus in this discussion of the pertinent literature is on research and research reviews conducted in the last 10 years.

Streaming for Mathematics Learning

Ireson and Hallam (1999) conducted an extensive review of the literature on ability grouping (streaming/setting) in the UK and internationally. They claimed that there appeared "to be complex interactions between grouping, teaching methods, teacher attitudes, the pacing of lessons and the ethos of the school" (p. 344) and that a return to ability grouping in the UK was unlikely to succeed. Ireson, Hallam, Hack, Clark, and Plewis (2002) examined the impact of setting on the attainment of year-9 students in English, mathematics, and science in 45 mixed secondary comprehensive schools. They found that pupils who did well in Key Stage 2 (end of year 6) mathematics tests "benefit more from setting than lower attaining pupils" (p. 311). They noted that students incorrectly placed in ability or attainment groups were likely to remain in them, and "placement error could have considerable long-term effects, particularly for children placed in low groups, limiting their chances of attaining higher grades in examinations" (p. 312).

Boaler, Wiliam, and Brown (2000) researched the effects of grouping practices in six schools on students' attitudes towards and achievements in mathematics. Curriculum polarisation was found to be a consequence of setting/streaming. Opportunities to learn were restricted for students in lower sets, and for some students in top sets the pace of learning was too fast. A more limited range of teaching approaches was associated with teachers of streamed/setted classes than among teachers with mixed-ability groups. Boaler et al. claimed that ability grouping "could be the single most important cause of the low levels of achievement in mathematics in the UK" (p. 646).

In Israel, Linchevski and Kutscher (1998) found that average and less able year-9 students' mathematics achievements in mixed ability settings were significantly higher than those of their peers in same-ability (streamed) classes, and that the performance levels of the highest achievers were about the same in both settings. In their longitudinal study in the USA, Burris, Heubert, and Levin (2006) found that the highest achievers from both streamed and mixed ability year-6 mathematics classes achieved similarly, but that the students from mixed ability groupings were more likely to have completed advanced mathematics courses in the future.

In Australia, Zevenbergen (2003, 2005) found that high achievers in streamed year 9 and 10 classes benefitted greatly, and that those most at risk were in the lowest streams. She claimed that ability grouping locked students in and was "achieved through a differentiated curriculum that increasingly reifies differences as students progress through school" (Zevenbergen, 2003, p. 7). The students' classroom experiences impacted on how they perceived themselves as learners of mathematics and their views on pursuing mathematical studies beyond year 10. Those from the higher streams identified with mathematics, were positive about the subject, believed themselves capable of achieving in it, and all said they would continue with mathematics into year 11. On the other hand, those from lower streams were cognisant of their limited mathematical experiences and "saw little point in the study of mathematics ... which marked them as inferior" (Zevenbergen, 2005, p. 618). These students were negative about mathematics, it was their least favourite subject, and all indicated they would not study mathematics ever again. Zevenbergen (2003) claimed that:

> Most often when students are grouped by ability, the outcomes support the practice—that is, the higher streams perform very well, and the lower streams perform poorly. This can be used as evidence to show that the practice is justified and that the groupings are correct since the outcomes 'prove' the effectiveness of the original groupings. However, questions need to be posed as to whether pedagogy is matching the needs of the students or whether the outcomes are a reflection of the pedagogies being used. (p. 3)

Boaler and Wiliam (2001) found that students in low sets/streams reported very negative experiences in their mathematics classes including: frequent changes of teachers, non-mathematics teachers allocated to the classes, and low-level work that they found too easy.

In a small study in the USA, the findings of Schinck, Neale, Pugalee, and Cifarclli (2008) were similar to those of Zevenbergen (2003, 2005). They compared the metaphors used to reflect views on mathematics of 34 year-9 and 10 students from high socioeconomic backgrounds attending a private school who were in the *regular* (Geometry) and *advanced* (Algebra II) tracks (streams). They cautiously concluded that for some of the themes that emerged there appeared to be a relationship between students' mathematical beliefs and tracking/streaming.

From the perspective of the economics of education, Hanushek and Wößmann (2005) estimated the effects of early "tracking," system-wide differing-ability schools, on academic performance. They compared the differences in outcomes at primary and secondary levels on international testing assessments for countries that systemically utilised tracking and those countries with comprehensive school systems. Three pairs of data were analysed for mathematics, two for reading, and three for science. It was found that mathematics scores were always lower at the secondary level in countries with early tracking (i.e., beginning in the early year levels of schooling), although only one of the three comparisons was statistically significant. The researchers concluded that early tracking appeared to increase educational inequality and reduced a country's mean performance, and that there was no equity-efficiency trade-off in adopting early tracking.

Streaming and Equity Considerations

The research literature specifically focussing on streaming for mathematics and equity issues (gender, language background/ethnicity, Indigenous background, or socioeconomic status) appears sparse. There are numerous reports and studies in which performance and equity issues are examined. Recent reports from large-scale national testing (e.g., NAPLAN, 2008) and international testing (2007 TIMSS—Thomson, Wernert, Underwood, & Nicholas, 2008), for example, highlight the poor performance of Australian students from lower socioeconomic and Indigenous backgrounds. Teese, Davies, Charlton, and Polesel's (1995) earlier analyses of gender differences in the Victorian Certificate of Education year-12 (high stakes examination) results gave rise to the phrase, "Which girls and which boys?", signifying that not all, but particular subgroups of males and females, comprise the educationally disadvantaged.

In some studies, differential course offerings and equity considerations are examined together, or form part of a larger study. Lamb, Hogan, and Johnson (2001), for example, reported on the relationships between mathematics and English course levels (curriculum differentiation), gender, and students' socioeconomic background. The data examined were from 1993, a time when there were differentiated mathematics and English options at the year-10 level in Tasmania (Australia). With respect to mathematics, the level of study accessed by students was found to be strongly related to socioeconomic background, gender, and school attended. Students from higher SES backgrounds were more often found in the top level mathematics courses than were students from lower SES; while in the lower level courses, the representation was reversed. Boys were more likely than girls to be in the lower level courses, "a change to the male dominance in mathematics that has been a feature of achievement patterns in the past" (p. 165).

With respect to gender issues, mathematics has been viewed historically as a male domain, that is, a discipline more suited to males than to females. In Australia, as elsewhere, there has been a persistent pattern of female under-representation in the most challenging mathematics subjects offered at the year-12 level[4] (Forgasz, 2006). Males also continue to be more successful than females, at least at the very highest levels of achievement (Forgasz, 2008). While the average gender gap favouring males had been closing (following concerted intervention efforts to redress the identified gender inequities), the most recent Australian data from the 2007 *Trends in International Mathematics and Science Study* (Thomson et al., 2008) and the 2006 *Program for International Student Assessment* [PISA] (Thomson & De Bortoli, 2008) reveal that the gender gap favouring males is widening once again. The 2008 *National Assessment Program, Literacy and Numeracy* [NAPLAN] (NAPLAN, 2008) results also show achievement gaps in favour of males at all year levels tested (3, 5, 7, and 9). The particular factors contributing to these recent trends have yet to be identified.

Research findings on affective factors and streaming for mathematics are informative. In the USA, Chiu et al. (2008) examined year-7 students' self-concepts and self-esteem by gender and mathematics track/stream. There were "no significant effects of gender or an interaction of gender and track" (p. 130) for mathematics self-concept and no relationship was found between self-esteem and track placement.

Findings on teachers' beliefs suggest that students' beliefs about their mathematical capabilities and their future pathways can be affected. Li (1999) reviewed the research in the field and summarised the findings as follows:

> ... despite no conclusive evidence, teachers have different beliefs about male and female students. They tend to stereotype mathematics as a male domain. This has been reflected in teachers' tendency to overrate male students' mathematics capability, have higher expectations for male students and more positive attitudes about male students. (p. 72)

Tiedemann (2002) reported similar results from Germany, claiming that even primary teachers "hold gender-differentiated views of their students' academic abilities" (p. 50).

Participation in the International Mathematics Olympiad is voluntary. Yet the gender composition of Olympiad teams reveals clear male dominance amongst the participants, that is, among those identified as the highest mathematics achievers (see Castelvecchi, 2008). Similarly, participation in the Australian Mathematics Competition is voluntary. Data

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[4] In Victoria, there are three mathematics subjects offered at grade 12. In order of increasing challenge they are: Further Mathematics, Mathematical Methods (in 2009, two parallel versions: one mandating graphics calculators, the other CAS calculators), and Specialist Mathematics – see Victorian Curriculum and Assessment Authority [VCAA] (2005) for details.

reveal that the majority of medallists (very highest achievers) are male (Leder, 2008), that among the year-12 students attempting the paper the proportion of males achieving prizes is higher than the proportion of males achieving the highest grades in Victoria's high-stakes year-12 mathematics examinations (Leder, Forgasz, & Taylor, 2006), and that there are several other mathematics competitions around the world in which males dominate at the very highest levels of achievement (Leder, Fullarton, & Taylor, 1994). Taken together, it can be inferred from these data that in non-compulsory contexts, males are more likely to take part or be encouraged to participate in mathematics-related activities. Why this is the case is unclear.

Interestingly, the Senate inquiry (Commonwealth of Australia, 2001) identified a range of other pertinent issues related to the selection and identification of gifted children that are clearly relevant to the selection criteria used to form streamed classes for mathematics. The Senate inquiry recognised that recently graduated teachers may be unskilled in identifying gifted students, and that "gifted students from low socio-economic areas, rural communities, non-English speaking backgrounds and Koorie communities are less likely to be identified as gifted despite research indicating that giftedness does not respect these boundaries" (Commonwealth of Australia, 2001, p. 39). It was also noted that the wrong tests (e.g., IQ) may be used to identify the gifted, and recommended that "a multifaceted approach to identifying giftedness, including both subjective and objective procedures" (p. 49) is best.

Summary of Research Findings from the Literature

The findings on the relationship between streaming and students' achievements are inconclusive, particularly for those at the highest levels of achievement. There is general agreement, however, that those in middle and lower achieving mathematics classes may be disadvantaged with respect to achievement, and that their future mathematics and life options are likely to be curtailed.

Other equity considerations – gender, language background/ethnicity, Indigenous background, and socioeconomic status – have not been a major focus in the research on streaming for mathematics. This is regrettable because there is clear evidence that those from lower socioeconomic circumstances and Indigenous backgrounds are underachieving in mathematics, and that some groups of students may be disadvantaged through school and class organisation as well as through school and societal attitudes and expectations.

It is noteworthy that there does not appear to be information available on the composition of top streamed classes in coeducational settings by gender or other equity variables. It is clear, however, from publicly available data and research reports that females are under-represented in the most challenging, non-compulsory mathematics subjects at the year-12 level across Australia. It may be that streaming is one of the factors contributing to these patterns. No similar data could be found with respect to groups of students by socioeconomic, language/ethnic, or Indigenous backgrounds.

Thus, it was considered important to determine the extent to which streaming is used for mathematics learning, to explore teachers' views on the practice, to gather information on the criteria adopted to select students for streamed classes, to identify if pedagogical approaches and limiting curricular differentiation were associated with streamed classes at different levels, and to find out whether particular groups of students are identified as benefitting from or being disadvantaged by the streaming practices used. Although data were gathered about grouping practices in secondary schools only in Victoria, Australia, the findings appear to have broader implications.

The Study

In Victoria, anecdotal evidence suggests that the extent to which streaming of classes has been adopted for mathematics has become more greater in recent years and that the practice is also very common at the lower levels of secondary schooling. (The mathematics teacher shortage noted earlier may be contributing to this phenomenon.) In line with the social justice imperative identified in the national curriculum for mathematics currently under development in Australia (National Curriculum Board, 2008, 2009a, 2009b), the aims of the present study were:

- to determine the extent to which streaming is used for mathematics teaching in years 7-10 in Victorian post-primary schools;
- to examine teachers' views on the streaming/non-streaming policies and practices in their schools;
- to categorise the forms of streaming used for mathematics teaching in years 7-10 and the criteria for allocating students into streamed groups;
- to explore whether teachers modify the curriculum and/or their pedagogical approaches in streamed classes; and
- to investigate if identifiable groups of students (e.g., males/females, high/low socioeconomic backgrounds, particular ethnic backgrounds) were considered disadvantaged by the streaming practices in schools.

Research Approach, Instrument, Sample, and Analyses

Research Approach

Survey methods were adopted in the present study and considered appropriate for gathering data to provide a reasonable overview of:

- the extent to which streaming is adopted for mathematics in Victorian post-primary schools; the range of ability-grouping practices adopted; and
- the year levels at which these grouping practices are employed.
- A survey was also considered an appropriate means to gain ideas about:
- mathematics teachers' views on streaming and the particular grouping practices adopted in their schools;
- whether the teachers modified their pedagogy in streamed classes; and
- if groups of students could be identified as disadvantaged by the streaming practices used in these schools.

An online survey was used. Because there is no direct control over sampling, this form of survey limits the broader generalisability of the findings even within the context in which they were gathered. However, de Vaus (2002) maintained that this did not mean that internet samples had no value. In particular, de Vaus (2002) maintained that "the internet can be a very useful means of obtaining representative samples of specific populations" (p. 79) with high internet access, including groups of professionals. In such cases "the internet may be a viable means of obtaining quite good samples of these groups" (de Vaus, 2002, p. 79). Since mathematics teachers comprise a professional group and the Mathematical Association of Victoria [MAV] is the roof body of this group, gaining permission from the MAV to have a link from its website to the survey was considered a suitable way to obtain information from a sample of mathematics teachers about the grouping practices used for mathematics in a range of Victorian secondary schools.

The Instrument

The online survey was developed using *SurveyMonkey* (see SurveyMonkey.com), a software application that allows collated responses to be downloaded into a spreadsheet. The research findings cited above guided the development of the survey instrument that is described below in more detail. Open and closed items were included. Item validity (that the intended meaning of the items was clear) was established by inviting preservice secondary mathematics teachers and colleagues from the mathematics education research community to complete and comment on an early draft of the instrument. Changes were made in response to the feedback received.

The following types of data were gathered; and sample items are provided:

1. Background information about the schools in which respondents worked:
   - What type of school do you teach at? (Government, Catholic, Independent)
   - Which term best describes your school location? (metropolitan Melbourne, regional Victorian city, small town in Victoria, other [please specify])
2. Background information about the teachers who responded:
   - Are you male/female?
   - Are you the head/coordinator of mathematics in your school?
3. The year levels at which streaming takes place in the respondents' schools:
   - For years 7-10, is a form of streaming (ability grouping) used for mathematics in your school?
   - At what year levels is streaming used?
4. Respondents' views on streaming, and on the grouping policies adopted in their schools:
   - Do you agree with your school's streaming/non-streaming policy for years 7-10 mathematics? Please explain your response.
5. For each year level, information on streaming and the pedagogical practices adopted in the streamed classes. [Respondents provided this detailed information only about the year levels they taught.]
   - Do you teach year 7 mathematics?
   - [If yes] Does your school use streaming for year 7 mathematics?
   - [If yes] What criteria are used to allocate students into the streamed groupings at year 7? [Tick as many as apply]: grades/marks, teacher recommendation, by invitation, student choice, parental choice, other. Please briefly describe the process for allocating students into the streamed groups.
   - If the year 7 mathematics class you teach is streamed, do you modify your teaching approaches in response to that? Please explain.

The Sample

The Mathematical Association of Victoria [MAV] agreed to post information about this study in its newsletter, *Highest Common Factor*, and on its website. Institutional (school) and individual members of the MAV at the secondary level were invited to participate by completing the online survey.

There were 44 respondents to the survey who provided information about the grouping practices used for mathematics in their respective schools. The range and types of schools are found in Table 1 and were commented upon above.

A summary of the personal backgrounds and teaching responsibilities of the mathematics teachers who responded to the online survey and provided information about the schools in which they worked is shown in Table 2. The data reveal that fewer males than might have been expected provided data, that the teachers' years of teaching experience covered the full spectrum, most respondents were employed full-time (83%), and a healthy number of the responding teachers headed mathematics departments (29%). The respondents' teaching responsibilities were reasonably balanced across the various year levels and, for the vast majority, mathematics comprised more than 50% of their teaching loads.

While the sample of teachers or the schools about which information were gathered may not be fully representative of the Victorian secondary school sector, it is argued here that they are far from unrepresentative, and that the data provided by these teachers are indicative of the realities.

Table 2
Characteristics of the Sample of Respondents

N = 44	n	Valid %		n	Valid %
Gender			Mathematics co-ordinator		
Male	13	30%	Yes	12	28%
Female	31	70%	No	31	72%
			No response	1	
Employment status					
Full-time	35	83%	Areas of teaching		
Part-time	7	17%	Mathematics only	20	45%
Casual	1	2%	More maths than other subjects	17	39%
No response	1		About 50% maths	5	11%
			Less maths than other subjects	2	5%
Years of teaching					
<2	5	11%	Levels taught		
2-5 yrs	10	23%	Year 7	20	45%
6-10 yrs	7	16%	Year 8	21	48%
11-20 yrs	11	25%	Year 9	23	52%
>20 yrs	11	25%	Year 10	30	68%
			Year 11	26	59%
			Year 12	27	61%
			Other (VCAL, CGES)	1	2%
			No response	1	

Analyses

Completion of the online survey was restricted to a 6-week period during the third term of the school year (from mid-August to the end of September, 2008). The findings from the 44 schools represented by the teachers who responded are reported in this article.

Descriptive statistics, including frequencies and percentages, to analyse the quantitative data were considered appropriate for reporting the findings. Inferential statistical procedures were inappropriate because the sample could be regarded as not clearly representative.

The open-ended items included in the online survey questionnaire were analysed manually and a grounded approach (Strauss & Corbin, 1998) was used to identify common themes and interpret the data. The reliability of the response categories was established by repeating the analyses several weeks apart. These qualitative data served to complement and qualify interpretations and understandings of the quantitative results.

Results and Discussion

The Extent to which Streaming was used for Mathematics Learning in Years 7-10

The respondents were asked whether there was a form of streaming for mathematics in their schools at years 7-10, and whether they agreed with the school's streaming (or non-streaming) policy. Responses to these two questions are shown in Table 3.

Table 3
Frequencies (and Percentages) of Responses about Streaming and School Policy

	Is there a form of streaming for mathematics in years 7-10?	Do you agree with the school's policy?	
		Agree	Disagree
Yes	35 (80%)	26 (74%)	9 (26%)
No	4 (9%)	1 (25%)	3 (75%)
No response	5 (11%)		

It was evident that various different forms of streaming for mathematics were being used in the schools and at different year levels. The data in Table 3 reveal that streaming was used in 80% of the schools and no streaming in only 9%; 11% of respondents did not answer this question. Of the 35 who said there was a form of streaming for mathematics in their schools, most (26, 74%) agreed with the policies in their schools. Of the four who reported no streaming was in place, only one agreed with the school policy.

Those who indicated that there was a form of streaming in years 7-10 were asked to indicate at which year levels it was used. The percentage of all schools with streaming in place at each of the year levels 7-10 is shown in Figure 1. [NB. Since some schools did not offer all of the year levels from 7-10 – for example, one was a year 9-12 school only – the number of schools offering the year level is shown in brackets.]

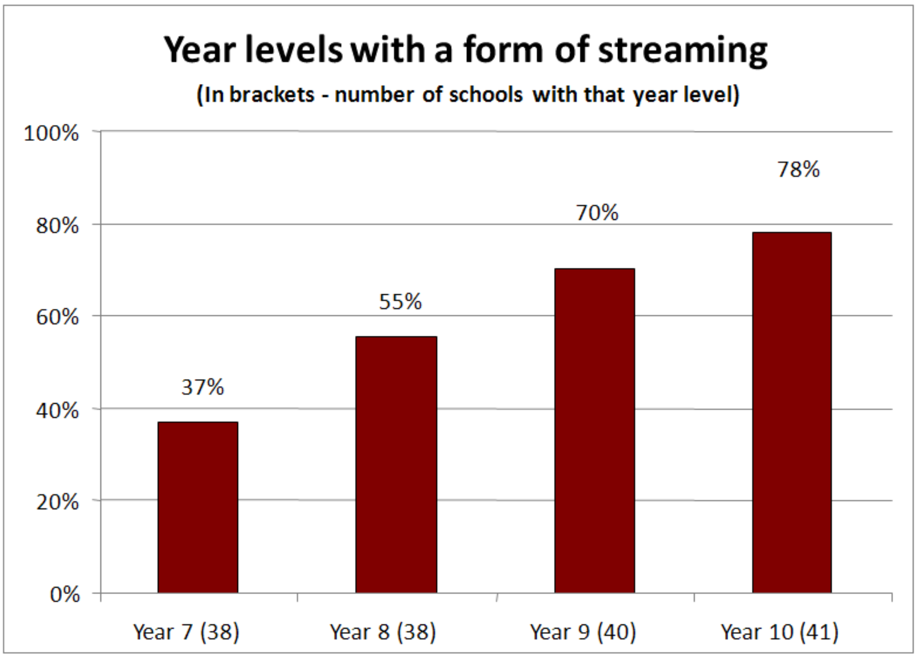

Figure 1. Percentages of schools with a form of streaming/ability grouping, by year level.

It can be seen from Figure 1 that as year level increases so does the percentage of schools with a form of streaming for mathematics. Although a few of the Independent and Catholic schools may have been P-12 schools (i.e., also teach the primary year levels), most of the year 7 students will have completed year 6 in a primary school where they were taught mathematics by a generalist primary teacher, and were now in a new high school with specialist mathematics teachers. Therefore, at 37% of all schools in the study, the extent of streaming at year 7 was arguably quite high. Ireson et al. (1999) cited survey findings in which it was reported that mixed ability groupings were adopted in 50% of year 7 classes in the UK, with setting becoming more prevalent as year level increased. In 2000, Boaler et al. (2000) claimed that ability grouping for mathematics was widespread in the UK. Exact figures were not provided, however. There does not appear to be data available for comparison anywhere within Australia.

Reasons for Supporting or Disapproving of Streaming Policies

Respondents were asked to explain why they agreed or disagreed with the streaming (or non-streaming) policies in their schools; 35 teachers provided reasons. Patterns among the responses were sought and representative examples are provided below.

The most common reason in support of streaming (or disagreement with non-streaming policies) was that streaming caters well for the needs of students of different abilities. Most who cited this reason focussed on both high- and low-ability students. Some of the reasons given were consistent with previous research findings (e.g., Hallam & Ireson, 2003) and with the recommendations of the Senate inquiry on catering for gifted students. With respect to the low achievers, however, the reasons did not correspond with previous research findings that reveal that low-achieving students do not benefit from streamed settings (e.g., Boaler et al., 2000; Linchevski & Kutscher, 1998; Zevenbergen, 2003).

> [Agreed with streaming policy] It enables advanced students to move ahead and not become bored with classroom activities. Provides healthy competition between students. Allows sensible discussion of concepts which most students follow and can participate in. Also allows students who have difficulty with mathematical concepts to learn at a pace more suitable to their needs and they improve their confidence in maths.

> [Agreed with streaming policy] It allows for both enrichment and extra help.

> [Disagreed with non-streaming policy] …maths teachers struggle with having such a wide spread in abilities ... it appears that the most common approach to dealing with this is to 'drag' all the students along at the same pace, i.e. teach to the middle. This is unacceptable as we are neglecting the bottom & top in each class. We need to cater for these students as well but we aren't.

Interestingly, as shown in Figure 1, streaming was widely adopted at year 10 and no teacher disagreed with this practice. However, some disadvantages were identified:

> [Agreed with streaming policy] [We] only stream at year 10. This is to better prepare students for year 11 maths pathways, particularly those intending to do Maths Methods. This is the first year we have done this and it has been successful as far as the Maths Methods pathway is concerned. It has caused some problems with the other year 10 classes in that groups of lower ability students are harder to teach.

Teachers' disagreement with streaming tended to be limited, or was related to certain forms of streaming practised in the school, for example, at year 7. The reasons provided echoed those from the research literature reviewed earlier including underqualified teachers, low/medium achievers being disadvantaged, and lack of flexibility/movement within streams (e.g., Boaler & Wiliam, 2001; Ireson et al., 2002).

> [Disagreed with streaming policy] We are trying to meet the needs of all ability levels while having many teachers working in the area who do not have formal mathematics qualifications and we ability group the students in an attempt to meet the needs of all students with the staff that we have. We are meeting the needs of the high achievers and the very weakest students but I'm not sure that those in the middle are not missing out. The students make the selection of pathway not the staff but advice is given.

> [Disagreed with streaming policy] In previous years I, as maths coordinator, could say when, where and if streaming could occur. The school now frowns on my 'flexible grouping' approach and I have to fight to group students as I think fit. I am lucky in that the school is small and maths classes from 7 to 10 are blocked.

> [Agreed with non-streaming policy] I 'group' in classes to allow for students to learn at their own pace and to provide added support to those that are struggling or need a challenge.

One teacher who disagreed with the school's policy commented elsewhere in the survey that while streaming could be justified at the year 10 level, streaming at year 7 was of major concern:

> They have just arrived from Primary, and are still forming their knowledge; they may have unfortunately had teachers that weren't strong in maths. To pigeon-hole them too early into an ability set could effect their choices later, often there are students that don't take things seriously until year 10 and then 'knuckle down'. Though I think with class sizes of 30 it's impossible to truly cater for the broad range of students' abilities well, which makes streaming at this level more appealing. With class sizes of 20-24, it makes it easier not to. Though I think it would be helpful to occasionally take out remedial groups for single sessions, but also extension groups, but not for the majority of the time. Either that or if you had a constant learning aide available….

Some teachers who agreed with the streaming policy in their schools were also aware of limitations: inappropriate at year 7, and questionable selection criteria.

> [Agreed with streaming policy] This is actually a "mostly" response. Streaming was introduced at Yr 7 this year, and I don't think that it is necessary or practical at this year level… [t]he students were selected by the principal based on a single test; no member of the Maths faculty was involved in the selection. In previous years, girls were accepted for

acceleration at the end of Yr 7 by a process of results and discussion at a meeting of the Yr 7 teachers.

In summary, the reasons provided in favour of or against streaming highlighted some of the positive effects associated with providing challenges and opportunities for high achievers. However, it should be noted that the Senate inquiry (Commonwealth of Australia, 2001) and the DEECD (n.d. c) suggest a number of other ways in which the gifted can be catered for in schools. For low achievers, some respondents perceived the negatives of streaming as caveats for the perceived benefits to higher achieving students. For a few respondents, there was clear concern about the limiting effects of streaming on particular students.

Criteria used to form Ability Groups.

It was assumed that the teachers would be most familiar with the grouping practices and criteria used at the year levels at which they taught mathematics. Hence data were gathered from only those who indicated that they taught mathematics at the various year levels. Of the 44 survey respondents, mathematics was taught by 18 at year 7, 14 at year 8, 14 at year 9, and 20 at year 10. The number of schools with streaming at the various year levels taught by these teachers and the criteria used for selecting students into classes are summarised in Table 4.

Table 4
Criteria Used for Selecting Students into Ability Groups at Years 7-10

		Criteria for selection into ability groups					
Year level	N (ability grouping)	Marks/ grades	Teacher recommendation	By invitation	Student choice	Parental choice	Other
		5	6	6	1	2	4
7	8	63%	75%	75%	13%	25%	50%
		5	6	1	1	2	1
8	6	83%	100%	17%	17%	33%	17%
		12	11	4	1	2	3
9	12	100%	92%	33%	8%	17%	25%
		13	14	5	10	8	2
10	17	76%	82%	29%	59%	47%	12%

The data in Table 4 indicate that marks/grades and teacher recommendation were the most common criteria used for forming the various types of streamed groups at each year level, although in some schools invitations were issued and students and/or parents could exercise some choice. In the majority of schools, however, students and their parents were fairly powerless in the process. Only at year 10 did student choice and parental choice become more prevalent; however, it would appear that these choices were used in conjunction with marks/grades and teacher recommendations. In other words, there was likely to be an intervention by the school if students and parents were considered to have chosen inappropriately.

In most cases, schools and teachers were using multiple criteria to group students. However, the prevalent criteria adopted for selection at years 7-9 – grades/marks and teacher recommendation – have the potential to disadvantage and close off options for some students through wrong placements (e.g., of under-achievers with higher potential) and low expectations (e.g., of those from low socioeconomic backgrounds).

In the survey, the teachers were also asked to provide descriptions of the processes used in making the selections into streamed groups. In the next section, some of these descriptions are used to qualify the descriptions of the forms of streamed groups. They highlight that the decision-making powers are generally more strongly vested in schools and teachers.

The Types of Ability Groups adopted at Years 7-10

Of the respondents who taught at the various year levels where streaming was in place (see Table 4), five provided descriptions of how groups were formed at the year-7 level, five at year 8, nine at year 9, and 13 at year 10. The types of grouping practices adopted varied greatly both within and across the year levels, as did the means by which the groups were formed.

Year 7. The five forms of streaming described at this year level were quite different. At one extreme, the whole cohort was streamed. For example, he grouping was based on the results of a test administered at year 6, and the principal, with no input from mathematics teachers, grouped the students. Another description was of a special needs group, with the rest of the classes being of mixed ability. The three other descriptions suggested flexible groupings. In one case, students began the year in mixed groups and later, based on test results, a "top" group was identified and the rest remained in mixed ability groups. A second description was similar, but the groupings differed for particular mathematical topics:

> We pre-test for the topics of whole numbers, fractions and decimal fractions and girls [single-sex school] are placed in groups for these topics according to their needs. For other topics, there is a class for the more able students and the other classes are mixed ability.

The third description suggested that ability groups and mixed groups were used at different times. The groupings were based on initial testing and pretesting for each unit of work:

> We have split them into ability groups that are relatively dynamic in some classes, but we also work together as mixed ability groups.

Years 8 and 9. Out of the 14 descriptions provided, the most common forms of streaming are summarised below. Representative descriptions of the types of streaming are presented, and each example is accompanied by the corresponding description of how the groups were formed.

- Advanced group/s, special needs group, the rest mixed ability (Yr 8: 2; Yr 9: 7).
    - One class for high achievers. One class for remedial. 3 mixed ability (Yr 8).
        - How groups were formed: Test results in year 7. Final exam. Teacher recommendation.

- 1 extension, 4 mixed ability, and 1 intervention (Yr 9).
  - How groups were formed: For students going into extension or intervention, letter and permission form to parents. Changes at the end of each term based on teacher recommendation and discussion with parents at P/T meetings.

- There are two classes for the high achievers. There are 3 classes for the middle level and 1 class for the low achievers (Yr 9).
  - How groups were formed: We do common assessment tasks, then gather the data and sort the students that way. Then staff look at the results and we make the changes that we think will be of benefit to the students.

- Advanced group/s, the rest mixed ability (Yr 8: 1; Yr 9: 2).
  - Two classes in year 8 advanced (effectively doing year 9 maths) and rest in core classes (Yr 8).
    - How groups were formed: Not completely sure [how groups are formed], but based on results in year 7 exams, enrichment opportunities, proven ability in problem-solving tasks. Students ranked by year 7 teachers and passed to Learning Area leader who then looks at numbers to fill 2 classes and offers to parents.
  - One SEAL (select entry accelerated learning) class. They have been separated since year 7. The rest are mixed ability (Yr 9).
    - How groups were formed: Entry test at pre year 7. Three students are new entries by their year 8 teachers' recommendation.

Of the remaining two descriptions of the types of streamed groupings, one was unclear (Yr 8), and the other indicated that full streaming was in place (Yr 9) with a small class (10-15 students) for the weakest students and a large class (up to 30) for the highest achievers.

Year 10. At year 10, the descriptions of all forms of streaming appeared to be related to pathways into year 11 mathematics courses. In some cases this was explained explicitly; in others it was clear to those familiar with the structure of the post-compulsory 2-year Victorian Certificate of Education [VCE] program normally completed by students in years 11 and 12, and the mathematics subjects offered (see VCAA, 2005).

- Streamed according to intended year 11 mathematics pathways[5] (Yr

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[5] Within the 2-year Victorian Certificate of Education program, there are three mathematics subjects offered at the year 11 level. In order of increasing challenge (and increasing future options with respect to mathematics study, post-school

10).

- How groups were formed: Students choose at the end of year 9 (along with their other subject selections) between year 10 pre Methods or year 10 pre-General. Prior to this, information is provided to year 9 about possible VCE Mathematics pathways by their Maths teacher. Some information is also provided to parents. Lists are checked and discussed with the year 9 Maths teachers. Students who may have made an inappropriate choice are counselled and encouraged to change. Students may still change after year 10 Semester 1.

- Students choose different pathways (Yr 10).
    - How groups were formed: Mostly the classes are compiled on teacher recommendations. Parent input is also required for students allocated to applied classes because it begins to close off VCE pathways and we won't do that without permission from the parents.
- High achievers complete the Methods Strand and the other students complete the General Maths Business Strand (Yr 10).
    - How groups were formed: Students can negotiate the teacher recommendation depending on Career pathways and motivation.
- The students follow on from their previous year's selection into the course – election into this course is based on examination results (Yr 10).
    - How groups were formed: Common tests and exams are used to rank students in year 8 and in Semester 1 of year 9. This is used as the starting point for grouping students in Semester 2 of year 9. Teachers meet to do the fine tuning for allocating students in the ability groups. At the end of year 9, students may be changed into other groups for the start of Y10 if their results have warranted the change. By the end of Semester 1 in year 10, the groups are fairly stable, but changes can be made for individual students if warranted.

In two schools, students were in accelerated streams taking year 11 subjects offered in the VCE; taking year 11 studies while in year 10 is permitted under VCE regulations.

- One class VCE Maths Methods, one class VCE General Maths, one class Foundation Maths, rest mixed ability but streamed into 3 levels within these core classes. (Yr 10)

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options, and career paths) they are: Foundation Mathematics, General Mathematics, and Mathematical Methods – see VCAA (2005) for details.

- [No description provided on how groups are formed]

The teacher from one school made it clear that, among the various differentiated offerings, mathematics programs designed for students who were counselled against continuing into year 11 mathematics courses were included.

- We have 2 mainstream classes with students who are honestly mostly below year 10 standard, but not too far. We had 3 "applied" classes for students who were not capable of regular year 10 mathematics and who use a Developmental Mathematics textbook rather than the standard Heinemann one. These students are advised not to continue maths of any kind in VCE. This semester we collapsed to 2 applied classes and created a mid-level "recovery" class for students who suddenly decided they desperately wanted to do VCE maths, and who were considered capable of achieving reasonable results. (Yr 10)
    - How groups were formed: We are a senior secondary college so students come to us having completed year 9 at other schools. They are allocated to the groups based on year 9 reports, recommendations from previous schools and choices by students and parents ...

The teacher from another school was less explicit but the names of the subjects clearly suggested that some courses were terminal:

- All kids have to do **normal maths or 'everyday' (easier) maths.** They choose everyday maths if they don't really intend to continue with maths. They can do a subject called 'preparation of methods,' which is exactly what it sounds. The SEAL kids do general maths 1 and 2. (Yr 10)
    - [No description was provided on how the ability groups were formed.]

The range of criteria used for grouping students for mathematics learning at year 10 and the mathematics options available to students were very clearly articulated with respect to the learning pathways within the final two years of schooling. For years 7-9, however, there was a sense that other, unmentioned factors, might also have been implicated in the practices adopted. In future research studies in this area, interviews with teachers and students at these levels should be included to tease out what these factors might be.

Pedagogical Approaches at Year Levels where Ability Grouping was in Place

If the teachers were teaching at year levels at which ability grouping was in place, they were asked if they modified their pedagogical practices in line with the classes they taught and what changes they made if they did. A summary of the responses is shown in Table 5.

Table 5
Change in Pedagogy in Classes at Year Levels where Streaming was in Place

		Pedagogy changed?		
Year level	N (streaming)	Yes	No	N/A—class not streamed
		4	1	3
7	8	50%	13%	38%
		3	1	2
8	6	50%	17%	33%
		10	1	1
9	12	83%	8%	8%
		16	0	1
10	17	94%	0%	6%

As can be seen in Table 5, several teachers indicated that their classes were not streamed and so the question was not applicable to them. In saying that their classes were not streamed, these teachers were likely to be in contexts where all, or the majority of classes, at a year level were considered "mixed ability" and they were teaching one of these classes. Those who indicated that they did not change their pedagogical approaches in their streamed classes (3) did not give reasons. Of those who acknowledged modifying their pedagogy (33), typical responses included:

> I teach the top level maths group. I incorporate more problem solving and "real-life" activities into these classes. Less time is spent on skill development as the students often have already well developed skills in many areas. If there are exceptional students then these students are given some extra work to allow them to extend themselves even further. Technology is used to enhance the learning experience of the children ... (Yr 7)

> I do not have to cater for the very weakest students. (Yr 8)

> My Higher Level class receive proofs and a conceptual approach to mathematics. I encourage them to come up with their own methodology to solve problems. Students complete exploratory, open-ended assignments with relational questions using IT - Excel, GSP, Graphmatica. My Standard Level class are given explicit methodology to solve problems with simplified proof about why it works. Individual students are given challenges where required. Some students are given a modified program where necessary. The Foundation Level program is focussed on practical mathematics where instruction focuses on how to break down language of questions into relevant and irrelevant information, and how to keep track of each section of each question. (Yr 9)

> More hands on and practical approaches as I take the weaker students. (Yr 10)

> The lower the level the more attention I give to approaches based on concrete materials or real-life applications and the less the level of mathematical abstraction. For instance, this year I have a Maths Standard class so topics and exercises are chosen to avoid complex algebra such as simultaneous equations. Or, in trigonometry, I have introduced the unit circle definitions of sine and cosine as well as radian measure but avoided graphs of sine and cosine. (Yr 10)

The impression gained from the comments was that, on the whole, efforts were made to adjust teaching approaches to meet the needs of the students in the classes. However, in many cases, the curriculum offered was also modified, hence limiting the opportunity for students in lower streams to move into higher streams even if they were very successful. At the year 10 level, curricular modifications appear consistent with the declared goals of preparing students for the various pathways within the VCE, the final 2 years of schooling. At years 7-9, such arguments are inconsistent with the social equity thrusts of the national mathematics curriculum currently under development (National Curriculum Board, 2008, 2009a, 2009b).

Do Grouping Practices Benefit all Students?

Whether or not streaming was in place, for each year level respondents were asked to indicate whether they believed the grouping practices adopted in their schools benefitted all students and to explain why. The teachers' views on the practices adopted in their schools – whether streamed or not at the various year levels – were mixed. At year 10, the majority of teachers where streaming was in place (13/19 respondents) believed that all students benefitted. The reasons they gave basically reinforced their views that the groupings were appropriate for the students' future VCE pathways. The responses of those who did not feel that all benefitted (6/19) clearly supported earlier research findings on the disadvantages of streaming:

wrong placements, students being locked in, better teachers allocated to higher streams, and low self-concept leading to the Pygmalion effect. Extracts from the responses included:

> ... there are two groups it does not benefit. First are those students whose level of abstract thinking develops a little slower than the average ... The second group ... are those placed in the wrong stream for their ability. They will either be bored or will struggle. Once a stream has been running for a few weeks the differences between streams become a gulf preventing students from changing to more appropriate streams. We all say it can be done but really it is too hard.

> The streaming in year 10 is driven by the Mathematics subjects in VCE. We would not stream otherwise. Lower ability students do not benefit by being grouped with students of similar ability. Even though it is the students' choice, they label themselves as being in 'vegie' Maths. Generally, the 'better' Maths teachers are allocated to the Year 10 pre Methods class.

> ... sometimes class numbers dictate that some students are in the wrong grouping.

At the other year levels where streaming was in place, those who felt that not all students benefitted noted that group placement, class size realities, and lack of knowledge about students were factors that disadvantaged some:

> We go through an extensive process to allocate students to classes, however sometimes it simply comes down to the timetable and the number of spaces available in a classroom. (Yr 9)

> Benefits extension and intervention groups, not sure about mixed ability groups. They miss out on the challenges provided by the better students. (Yr 9)

> It will never benefit all but it benefits most (Yr 8)

> The selection process is completed without recognition of how the students work, and it is too early in the students' education. (Yr 7)

Among those at all year levels who saw benefits to all in the types of grouping practices adopted in their schools, very few provided explanations, perhaps assuming that the benefits were self-evident. Lower levels of frustration and more time for weaker students to deal with the mathematics were the main advantages noted by those providing reasons:

> I think the core students are allowed more time to develop understanding of concepts because top students are not demanding to be moved on. Also, in our school it results in smaller core class sizes than happen in other subjects. (Yr 8)

> Mixed ability classes allow students to work at different levels in different topics and expose them to the thinking of other students working at

> different levels. Very weak students are not frustrated as the curriculum can be modified to meet their specific needs. (Yr 8)
>
> Mostly, as there is a great deal of consultation over where each student is placed, and there is the opportunity for movement between groups. (Yr 8)
>
> It appears to be very positive for the students, and parents are satisfied with it. (Yr 9)
>
> ... low ability level students have the time to have their issues addressed and feel more confident asking questions. (Yr 10)

No teacher identified Indigenous students, those from low socioeconomic background, particular ethnic groups, or girls as being disadvantaged by streaming. It is interesting to speculate whether responses would have differed had specific questions been asked. The decision not to be specific was deliberate as it was anticipated that some teachers would recognise streaming as disadvantaging one or more of these groups of students. It is strongly recommended that specific questions should be included in future studies on streaming for mathematics in which equity considerations are of interest.

Final Words

Findings from the survey reported here suggest that streaming for mathematics is well entrenched among the Victorian schools from which data were gathered in this study. The extent of the practice was seen to increase as year level increased. Most teachers supported the streaming practices adopted in their schools, the main reason being that it enables teachers to cater best for students of different achievement levels. Several teachers were only partially supportive, and a few disagreed with their schools' practices.

The advantages and some of the potential limitations of streaming were recognised. For high achievers in particular, streaming was seen to provide opportunities to be extended, enriched, and challenged, and teachers had the chance to provide these opportunities without also having to deal with weaker students. The disadvantages of streaming identified were consistent with those previously reported in the research literature and included the effects of placement errors; inadequate selection procedures; year 7 too early to introduce streaming; that there were alternative ways to cater for individual differences; classroom management problems in classes of lower achievers; the best teachers allocated to top streams and the least qualified to low achievers (possibly contributed to by teacher shortages); and low- and middle-level achievers potentially disadvantaged with many mathematical and life options being prematurely constrained.

The data also revealed that a range of types of streaming practices were in place in the schools, including separating out only top achievers or only the lowest achievers; having top-, mixed-, and low-achieving groups; and grouping students differently by mathematics content area. In most schools a combination of test results (classroom-based and/or standardised tests) and teacher recommendations were used to form the streamed groups at years 7-9, with very few allowing students and/or parents to choose. At year 10, the streaming tended to be based on pathways leading to VCE mathematics options. Results and teacher recommendations remained important for grouping students but many schools allowed input from students and parents in the decision-making. It was at year 10 that there was disquiet among several teachers who felt that streaming may have disadvantaged late bloomers and those wrongly placed. It was acknowledged that movement between groups was atypical and that there were longer-term, life-building consequences for these students.

The findings of this study did not support Hattie's (2002) claim that "teachers appear not to change their teaching activities when class composition is changed" (p. 449). However, it was apparent that pedagogical change was most prevalent in the mathematics classes of high achievers. This may be explained partially by the likelihood that these teachers had strong mathematical backgrounds, and therefore the confidence to allow students to engage with challenging and open-ended mathematical tasks. Some of those teaching weaker students, it appeared, tended to focus on traditional "drill and practice" approaches to assist students to understand basic mathematical skills.

As noted above, equity considerations were not identified by the teachers as factors of disadvantage in association with streaming practices. As a result of the survey instrument not including specific questions about equity in the study, it is not possible to draw conclusions about the role that streaming might play in the well-documented disadvantages in the mathematics achievement of these groups, or in limiting their future mathematics enrolment options and career paths.

Finally, the initial draft of the national curriculum document for mathematics includes equity goals for which some of the forms of streaming found in the present study, and the criteria used to form the groups, appear inconsistent. It is clear that teachers, school leaders, teacher educators, and providers of professional development will need to be more aware of alternatives to some current streaming practices in order to meet the:

> ... commitment to ensuring that all students experience the full mathematics curriculum until the end of year 9, with mathematics being compulsory in year 10, and with schools developing relevant options preserving for all students the possibility of mathematics study in year 11. (National Curriculum Board, 2008, p. 6)

Striving to attain the socially just goal of meeting the mathematical needs of all students, while not prematurely limiting options, must remain high on the agenda.

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