

Equity and social justice in the teaching and learning of mathematics



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Equity and Social justice are important issues in Mathematics teaching. This essay explores the relevance of how Mathematics Education may be a necessary factor in determining the social justice of a child's upbringing, and consider how equity can be used to ensure an education that is fair in its opportunities for all children to achieve progression in their learning.

Social Justice in Mathematics Education

Watson has confidence that all children are capable of learning 'significant Mathematics given appropriate teaching'. She believes that there is a 'moral imperative' that children are educated well in Mathematics in order to 'realise the full potential of the human mind' and that there is empowerment when a child realises that they can enjoy learning Mathematics. It is a matter of 'social justice' to teach Mathematics to all children as their achievement in the subject is judged throughout their life and can participate in determining future prospects. Grades achieved in Mathematics can affect future studies and career paths. For example, to enter university, usually a minimum of grade C GCSE Maths is required, and this requirement varies depending on the course.

In Mathematics, setting is used to group pupils according to their ability and students are entered in for an exam tier depending on what set they are placed in, which determines the maximum grade they can achieve. Usually in secondary schools, the sets are formed in year 7 or in year 9 after SATs and these sets rarely change and so even if individuals make progress over the years before sitting the GCSE paper in year 11, it does not make a difference as the maximum grade that they can achieve will not reflect their

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capability. Only a maximum of grade D can be attained in the lower sets. (Day, p. 165) As a result, children in these sets will not be able to go to university, may not get into a particular course or will have to take their GCSE Mathematics again at a later stage, rendering their first grade D useless. This seems unfair for the lower setted students, whose full potential may not have been realised and who surely deserve the chance to achieve a higher grade if they are able to progress over the year.

Every Child Matters

A UK government initiative programme called 'Every Child Matters' has the aim of helping 'every child, whatever their background or circumstances, to have the support they need to be healthy, stay safe, enjoy and achieve, make a positive contribution, and achieve economic well-being.' The idea behind this scheme is that all institutions that affect a child's life work together to create a stable and supportive environment for their development educationally and socially. The education institutions aim to help a child achieve mathematical learning but also try to develop mathematical learning and thinking on a wider level, supporting all areas of life. (website 2) The question to be asked is if setting in mathematics classes really contributes towards that aim or, more likely, hinders it?

Setting by ability

Mathematics teaching is in two forms; mixed ability teaching, where all students learn together, or setted classes, where students are split into groups in terms of ability level. Higher sets are taught more advanced Mathematical concepts, topics and skills as they are thought to have the potential and basic knowledge to understand it. The lower sets are taught

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more basic Mathematics and at a slower pace to allow them enough time and practice to learn and understand and so their learning and depth of Mathematics is restricted.

Students are entered for a GCSE Mathematics exam paper appropriate to their level, depending on what set they are in. However, lower sets can only achieve grades D-G which are not usually accepted as being high enough to enable the student to study further and may prevent them from studying a particular course. In this way, the GCSE examination itself is split into tiers, with only the higher sets being allowed to attain ‘good passes’ of grades A*-C.(Archer, Hutchings and Ross, 2003, p. 139)

There are many questions concerning the fairness of such an arrangement. As students in lower sets would not have covered the content that would be examined in the higher tier, it is not appropriate to enter them for the higher or intermediate tier. Therefore, as a result of mathematics setting, ‘those in lower sets are less likely to be entered for higher tiers’, consequently harming their future study and job opportunities. Also, some children have an advanced grasp of Mathematics due to an advantaged background, parents’ help or private tuition. This could mean that setting is unfair as it is biased towards early developing children or those who have been given extra help outside of the classroom.

My experience

In secondary school, even after attaining Level 7 in year 9 SATs, I was put in set 2 as set 1 was full. This meant that I was entered for the GCSE

Mathematics intermediate tier which only allowed me to gain a maximum of

grade B. After scoring over 95% in two of the module exams and discussions between my parents and teacher, I was allowed to move into set 1 as my achievement was higher than those who were already in set 1 so it was unfair to restrict me from sitting the higher paper and having the chance of getting an A. As the higher set moves at a faster pace as it has a bigger syllabus to cover, I had to spend 3 months catching up on work that I had missed. In the end, I ended up with an A* in GCSE Mathematics and studied a degree in Maths. This proves that higher achievement is possible, if given the opportunity.

Advantages of setting by ability

The ex-Prime Minister, Tony Blair, agreed with setting children by ability. He states: ‘ The modernisation of the comprehensive principle requires that all pupils are encouraged to progress as far and as fast as they are able’ and that ‘ Grouping children by ability can be an important way of making that happen.’

The main advantage of separate ability grouping is that all students get the chance to learn at a pace suitable for them and they are not distracted from students of a different ability level with different educational needs. With setting, students are only given the work that they are capable of completing otherwise it could harm the child’s confidence and self-esteem levels, resulting in dissatisfaction and frustration for both pupils and teachers, class disruption and lower attendance levels.

Alternatively, people argue that mixed ability groups are more productive for all students. Evidence from research suggests, ‘ all pupils gained socially

from working in wide ability groups' because, ' such groupings allowed pupils from a wide variety of backgrounds, as well as abilities, to work together, strengthening social cohesion'.

Disadvantages of setting by ability

There is a big question of authority about who can decide on appropriate setting in the first place, and how? In schools, the setting system is supposed to be purely based on ability level. However, in reality, streaming could be decided upon for other reasons. For example, two areas of prejudice encountered can be social class and ethnic dimensions. Bartlett, Burton and Peim point out that often ' lower class pupils were deemed to have a lower intellectual ability than middle class peers purely due to unrelated social issues such as accent or parents' jobs.' Sukhnandan and Lee (1998) comment on the fact that lower-ability sets consist of a high number children from low social-class backgrounds, ethnic minorities, boys and children born in the summer, who are at a younger age for their school year. (website 1)

Harlen's study (1997) suggested that ' teachers with substantial experience of teaching mixed ability groups frequently used whole class methods inappropriate to mixed ability groupings and that teachers retained largely fixed views of ability and intelligence'. (Capel and Leask, 2005, p. 155) A clear disadvantage of setting is that children can be stuck in one set for years and are then branded as holding a set ability for the rest of their education. (Ollerton, 2002, p. 264)

Setting prevents children from mixing with other ability levels in the classroom environment, giving them an unrealistic expectation of future life

and general working environments. The problem of self-esteem is an issue for the lower setted pupils, who feel dejected that they are perceived as having weaker ability. Self-esteem is also an issue for higher setted pupils, who can be 'developmentally damaged' in a different way by their high set 'over inflating their self-esteem'. Sukhnandan and Lee believe that setting in this way causes 'social divisions'. (website 1)

Self-esteem is essentially important for children in learning Mathematics. If a child has lowered self-esteem they could convince themselves that they are not bright enough to understand and so underachieve due to their negative attitude. Equally, high self-esteem in Mathematics can make a child overly-relaxed and over confident causing them to slack. Research has shown that setting pupils has 'a direct impact on the pupils' perceived mathematical competence' and children can be affected psychologically about what they can or cannot do and learn. A student who is setted is 'branded' and this branding can affect the students' perception of themselves and others peoples' perceptions and judgement of them.

Gender Issues

Boaler points out that setting children by ability can cause anxiety about exam performance among the more able pupils and underperformance, in particular, from girls. (Boaler, 1997) Boaler suggests this underperformance is due to crumbling under the pressure which affects girls more than boys because girls have 'a tendency to lack confidence'. Ollerton supports this idea that setting by ability 'creates the conditions for under-achievement', a view also believed by Boaler and William (2001). Another issue of children being streamed based on their achievements and not on their potential

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means that ‘underperforming, very able pupils and pupils who are hardworking and perform well on tests can easily be placed in the same achievement group’. Indeed, an able pupil who is underachieving would be placed in a lower set than their ability should demand, whereas a lower ability pupil who has the ability for performing well under pressure in exams could be placed in a higher set than their natural ability would normally allow.

In a similar way, behaviour could also cause unfairness in setting as boys often mess around in the classroom but perform well in exams. They could be placed in a lower set due to their bad behaviour and lack of attention, but their ability in Maths could be worthy of a higher set. Research shows, for boys in particular, that ‘the set they were in reflected their behaviour more than their ability.’ Girls tend to do better in communicative tasks and enjoy writing more than boys who ‘often don’t enjoy “writing up” coursework’ and research conducted has shown that girls tend to do better in coursework compared to exams whereas boys do not do well in coursework but perform well in exams.

Modularisation in Mixed Ability Teaching

The main concern in a mixed ability class is for the teacher to decide what to teach and how to teach to a wide spread of abilities, which is still a concern in a setted class. Sukhnandan and Lee (1998) comment that a modular approach would benefit a mixed ability class. They suggest that schools should try to teach pupils’ in relation to their individual needs rather than streaming by general ability, with equity in teaching more easily achieved ‘through greater modularisation of the curriculum, an increased emphasis on <https://assignbuster.com/equity-and-social-justice-in-the-teaching-and-learning-of-mathematics/>

independent learning and improved library and information technology resources’.

It seems that ‘ what goes on in the classroom’ and ‘ the teaching strategies used, is likely to have more impact on achievement than how pupils are grouped’ A teacher’s goal is to encourage progression of learning Mathematics in the classroom for all students. In order to achieve this, Ollerton suggests that this modular approach to teaching Mathematics creates the feeling of having a fresh start to every section of learning, therefore, helping self-esteem as everyone can ‘ embark upon a journey to learn, say trigonometry’. This progressive idea challenges the view of the hierarchical structure of mathematical learning, (Ollerton, 2002, p. 266) where everyone can start at the same level.

Differentiating Teaching Content

Tomlinson comments on the importance of differentiating the content of a Mathematics lesson in a mixed ability classroom. She points out that this includes adapting ‘ what we teach’ and modifying ‘ how we give students access to what we want them to learn.’ Giving different ability level students different tasks appropriate to their ability is differentiating what they are learning. Tomlinson explains that giving students, of higher ability, time to read part of a text on their own while taking time to go through the text with the lower ability pupils separately differentiates their access to learning as they are learning the same thing in different ways, appropriate to their ability level. (Tomlinson, 1995, p. 72)

It appears that Mathematics would benefit from an approach that considers differentiation in what is taught rather than how it is taught. Some Mathematical concepts would be too difficult for some children to understand, so the teacher must differentiate between the content suitable for the weaker students from stronger students. For example, 'trigonometry ... is only introduced to students in higher groups' (Boaler, p. 7)

Equal Rights and Equity in Mathematics Education

In the context of teaching, the issue of equity is often confused with equality. According to Zevenbergen, 'equity refers to the unequal treatment of students in order to produce more equal outcomes'. This contrasts equality which means 'the equal treatment of students with the potential of unequal outcomes'. For example, students who have disadvantaged backgrounds could be offered extra help to catch up with their advantaged peers' in order to hopefully achieve 'parity in the outcome for all students.' The alternative method of equality would mean that all students are given equal treatment and the same opportunities to succeed. However, some students would take more advantage of the opportunities and the results may be more unequal than with an equity programme. Equity programmes are 'designed to be more proactive and seek to redress differences in prior experiences', whereas equality programmes are more conservative in their approach and acknowledge that some students will achieve more than others. If children are taught in a way that meets their individual needs then justice in education, a prime aim of Every Child Matters, can be achieved.

English as a Foreign Language

Language competency is an issue for students who speak English as a second language, causing them to underachieve in Mathematics. In order to read text books and understand verbal instructions, students must work within the language of instruction. Educational progress is enhanced depending on whether a student's first language is that of their instruction or not. (Zevenbergen, 2001, p. 15)

Mathematics has many words particular to the subject, for example, 'integral, differentiate, matrix, volume and mass'. This can be confusing for non-native English students, as they have to learn new meanings in the context of Mathematics. (Zevenbergen, 2001, p. 16) The same word can be interpreted in different ways by non-native English students, causing misunderstandings which affects learning. Teachers may find that this lack of language background can make a Maths class very difficult to teach. For example, the words 'times' normally is related to the time on a clock, not to multiplication; the words 'hole' and 'whole' sound the same but have different meanings, in maths meaning a whole number. (Gates, p. 44)

Students with language issues may work more slowly or misunderstand questions and hence, be setted at a lower level in Maths, which is clearly unfair.

Special Educational Needs (SEN)

Children with special educational needs require different teaching methods. Learning disabilities which need to be considered in the maths classroom include dyscalculia, where the child cannot grasp the meaning of number,

poor numeracy skills, problems such as Aspergers syndrome and autism, or physical disabilities and sensory impairments. (Cowan, 2006, p. 202-203) For these students, the teacher needs to be aware of using simple and precise instructive language, a clear method of presentation, modified content of difficulty and work structured with reduced quantity. (Cowan, 2006, p. 203)

How Equity can mean Social Justice for all Learners

It is clear that ‘ the tiering of mathematics papers is likely to have an important impact’ on student development and pupils often ‘ make more progress if taught in a higher set rather than a lower set’ . This means that in mathematics teaching, the same topic should be addressed in a mixed class and tasks can be organised according to needs level. The National Numeracy Strategy (NNS) advises planning a lesson using three stages: pre-active phase, where necessary prior knowledge is identified and presentation planned; interactive phase, where teaching takes place and tasks are worked through, including a plenary at the end summarising the lesson and the evaluative phase, where the teacher reflects on the lesson and on learning successes or difficulties. (Cowan, 2006, p. 59)

By following a structured lesson plan, ‘ using a range of tasks comprising different levels of difficulty but addressing the same topic or theme within the one class’, (Cowan, 2006, p. 212), equity can be achieved for all students of different ability level. In this way social justice is maintained for all students in mathematics teaching and learning.

Conclusion

The government's Every Child Matters initiative supports the view that equal rights for all children means equal opportunities for all children. It seems that in order to achieve this kind of social justice, every child needs to be given the chance to take an examination paper that allows them to achieve an A grade. In doing this, each child will have an opportunity to go on to further study should their ability and interests allow. Setting by ability not only makes this difficult, but actually increases problems in the classroom, such as damaged self-esteem and under-achievement and can even encourage some prejudice regarding race and class. Setted classes are not necessarily easier for teachers to teach either, as they will still need to differentiate content for different class members. It therefore seems that a strong lesson structure incorporating modularisation and appropriate differentiation in teaching content will provide a more effective environment in which equity can be used to maintain social justice in the teaching of Mathematics to children in a mixed ability classroom.