Primary school teachers tackling social justice issues through teaching mathematics

Pete Wright[1], Caroline Hilton[2] and Joel Kelly[3]

[1]University of Dundee, [2]IOE, UCL's Faculty of Education & Society, [3]The Blue School, CofE

In this paper we present further findings from the Primary Maths & Social Justice research project. The aim of the project was to explore how primary school teachers can tackle social justice issues through teaching mathematics. We employed a participatory action research methodology, which is a collaborative approach that recognises the essential contributions of both academic researchers (with their previous experience of research) and teacher researchers (with their in-depth knowledge of learners) to the research process. We established a research team that held a series of meetings in which we planned, taught and evaluated a series of research lessons. We carried out a thematic analysis of the data collected from these meetings and follow-up interviews. We discuss here three themes that emerged from this analysis: students' increasing levels of 'socio-mathematical agency'; teachers' reflections on enacting change through collaboration; and the impact on teachers' practice of their developing relationships with mathematics.

Keywords: primary mathematics; social justice; socio-mathematical agency

Introduction to the Primary Maths and Social Justice (PMSJ) research project

We drew attention in our earlier paper, published in the proceedings of the BSRLM Conference held one year ago (Wright, Hilton, & Kelly, 2023a), to increasing calls for a revised school curriculum that fosters in learners the critical understanding and collective agency needed for our global society to address the significant social, economic and environmental challenges it faces (UNESCO, 2015). Given the key role that mathematics plays in such a curiculum (Skovsmose, 2021), consideration needs to be given to how the subject is taught throughout the curriculum, including at primary school level (age 5 to 11 in England).

Teachers often attribute their motivation for becoming a teacher to an interest in social justice issues. However, they commonly lose sight of this interest once they become absorbed into an education system that prioritises attainment and test results over more humanistic aims (Wright, 2021). The Primary Maths and Social Justice (PMSJ) research project was a collaboration between the three co-authors and six teacher researchers from two neighbouring primary schools in London. The aim of the PMSJ project was to enable teachers to engage with their interest in tackling social justice issues through their teaching of mathematics in the primary school classroom.

It soon became clear from early discussions with the teacher researchers that they considered designated mathematics lessons to offer little opportunity for tackling social justice issues, as the commercial schemes of work both schools followed (based on 'mastery' approaches) were perceived as allowing limited flexibility. Our attention switched instead to the opportunities provided by cross-curricular activities, that frequently incorporated social justice issues such as equality and climate change, that

were already well-established in both schools (as is commonly the case in primary schools in England).

There is evidence that students in primary school classrooms rarely draw on their disciplinary knowledge in making sense of such issues, preferring instead to draw on their own experiences outside school and opinions they encounter amongst friends, family and the media (Jerome, Liddle, & Young, 2021). We therefore set out to explore how teachers could support their students in applying the disciplinary knowledge they learnt during designated mathematics lessons in making sense of the social justice issues they came across during cross-curricular activities.

The concept of 'socio-mathematical agency', defined as the capacity to apply mathematical knowledge effectively to argue collectively for social change (Wright, 2022), seemed relevant here. This resonates with calls for a more humanistic school curriculum referred to earlier. The PMSJ research project therefore set out to explore the following two research questions:

> How can primary school teachers maintain and build upon their interest in addressing social justice issues through the teaching of mathematics?
>
> How can primary school teachers help students develop their 'socio-mathematical agency', i.e. critical understanding of mathematics and collective mathematical agency?

In this paper we focus on the second of these two research questions. We report on selected findings that are relevant to answering this question.

Methodology and research design

We established a research team, consisting of the co-authors and the teacher researchers that operated according to the principles of participatory action research methodology. These include genuine collaboration and the recognition that academic researchers (with their previous experience of research) and teacher researchers (with their in-depth knowledge of learners) both have an important and complementary role to play in the research process. We held a series of research team meetings that focused on drawing links between theory and current practice, planning and evaluating two research lessons. The teacher researchers played a leading role in the research design, deciding the focus and content of research lessons and developing and administering data collection tools and protocols.

The data on which this paper is based were generated from audio recordings of evaluative discussions held during research team meetings and interviews between the co-authors and teacher researchers, designed to capture their experiences of participating in the project, that were held near to the start and end of the project. These audio recordings were transcribed and analysed using thematic analysis (Braun & Clarke, 2022). We present selected findings from this thematic analysis in the next section. A more comprehensive account of the findings, as well as further details of the project including activities tried out in research lessons, can be found in the PMSJ research project report (Wright, Hilton, & Kelly, 2023b), available on the Teaching Maths for Social Justice Network website: www.mathsocialjustice.org/research

Findings

We report briefly on three themes that emerged from the data analysis. Note that each theme is developed further in one of the three conference papers presented by the authors at the CERME Conference held in Budapest in July 2023 (these papers are

referenced after each theme below). The three themes selected for this paper are: (1) students' increasing levels of 'socio-mathematical agency' (Wright, Hilton, & Kelly, 2023c); (2) teachers' reflections on enacting change through collaboration (Kelly, Hilton, & Wright, 2023); and (3) the impact on teachers' practice of their developing relationships with mathematics (Hilton, Kelly, & Wright, 2023).

We provide examples below of quotes from teacher researchers that were used in identifying each theme (these are the same quotes that featured in our conference presentation). Note that the real names of teacher researchers have been replaced by pseudonyms. The students belonged to classes in Year 1 (ages 5 to 6), Year 2 (ages 6 to 7), Year 5 (ages 9 to 10) and Year 6 (ages 10 to 11).

Theme 1: Students' increasing levels of 'socio-mathematical agency'

The teacher researchers (TRs) described how they noticed a growing appreciation amongst students of how mathematics can be relevant and applicable to their real-life experiences. This resulted in higher levels of engagement.

> So, we saw that, when they went off doing their independent task … the children had a better overview at the end and were able to feedback during the plenary, and actually give answers that had reasoning behind them, rather than just: "This is the answer and that's it." … the children have more to say about social justice, or fairness, equality, doing the maths, where it made an impact on their own lives … (Emma, Year 1 teacher, Meeting 5)

The TRs were impressed with how well students embraced the opportunity to use mathematics to solve real-world problems relating to social justice. They reported on how students became increasingly able to use mathematics to strengthen their arguments for change and became more appreciative of the power of mathematics in presenting an argument.

> I think it's had a really positive impact on the students and in how their understanding of mathematics and the importance of mathematics, not just in the context of a maths lesson, but in the wider world. (Aidan, Year 2 teacher, Interview 2)

The TRs described students' enthusiasm in working collaboratively on problem-solving mathematical tasks, including engaging in passionate discussions with others, during activities tried out in research lessons.

> … there was some really passionate debate and lots of really good, sensible kind of comments and examples being put forward by the children … And in the lesson that we taught, they were just really passionate about putting across their opinions as well, which is quite nice to see. … It was nice to see kind of the teamwork aspect of it work quite well. (David, Year 2 teacher, Interview 2)

Theme 2: Teachers' reflections on enacting change through collaboration

The teacher researchers (TRs) noted how they managed to overcome the perceived challenges they faced at the start of the project and found it achievable to enact change.

> So, it's opened my eyes, I guess, a bit more to … not kind of pigeonhole, you know, seven-year-olds into "they won't understand that or that, this isn't relatable to them at their age". Actually, to be more ambitious, if you like, to think actually they can do more than you realize, you just need to give them the right framework to be able to do it. (David, Year 2 teacher, Interview 2)

The TRs expressed surprise at how even very young students were able to engage in applying mathematics knowledge to tackling social justice issues. There was a growing appreciation of the impact of the project on their students.

> I think it's got me thinking about, even though they're five and six-year-olds, they have opinions, they have quite good ideas. And, like, getting them involved in classroom decisions, I think, is very beneficial, even from that age. And I think, beforehand I, maybe, dismissed slightly, of them being so young, that maybe they won't understand. (Emma, Year 1 teacher, Interview 2)

The TRs reported how the collaborative nature of the research team supported them in generating new ideas and invigorated lesson-planning process.

> The collaboration, the meetings with other teachers. I liked it when we shared all ideas and we heard what other year groups were doing … seeing how they were approaching it, just helps. And being able to bounce off other people, as well as speaking with that yourself and the other researchers, just having like a sounding board, I think it's crucial … if you're trying to do something new, you just need to get a group of like-minded people, who will have different skill sets, to kind of work with each other, but also challenge and suggest new ideas. (Rose, Year 5 teacher, Interview 2)

Theme 3: The impact on teachers' practice of their developing relationships with mathematics

The teacher researchers (TRs) exhibited varying relationships with mathematics, with some having previously experienced fear and anxiety towards the subject, whilst others had developed a passion for the subject. Over the course of the project, they all began to view mathematics in a different light and noticed the impact this had on their practice.

> It's made me look at my planning a little bit differently and see what we can bring into it … seeing, actually, how more practical aspects benefit different children, it's helped to sort of identify that and bring it into the teaching. (Kate, Year 1 teacher, Interview 2)

Many of the TRs had previously struggled to see how mathematics could be made more meaningful to children. The project prompted them to develop alternative perspectives which enabled them to identify how mathematics could be taught in more engaging, meaningful and inclusive ways.

> I always thought that was something I had done in all my maths lessons anyway. I was trying to make it, kind of, real life if possible, using things that are tangible, relating it to things that are going on in the world and stuff. But I guess, after the first interview, I was a little bit taken back by "Oh well, maybe they haven't kind of grasped this" … I put a lot more emphasis in, not just in the kind of standalone lessons, but in my lessons in general, to make a point of maybe stop and take a moment to have a bit of a longer discussion, rather than having that like brief introduction of how this is relevant to the world. (Aidan, Year 2 teacher, Interview 2)

The TRs reported how they managed to navigate the constraints of the curriculum and began to successfully challenge students' beliefs about mathematics.

> It's not a case of "We're going to do fractions today", it's a case of "Why is it important that we know how to do fractions?" or whatever the specific learning intention might be. So, I think that always relates to the children and their world, and their future world. … And that's a regular thing through the lessons. (Layla, Year 6 teacher, Interview 1)

Discussion and conclusion

Much of the previous research into teaching mathematics and social justice has been carried out with older students, for example in secondary schools (age 11+) in England (Wright, 2021) and in high schools (age 14+) in the US (Gutstein, 2016). Research involving younger students is less common, although there are notable exceptions, for example in primary schools (ages 5 to 12) in Scotland (Hudson, Henderson, & Hudson, 2015). This may be partly due to a misguided belief that younger children may not be ready to tackle social justice issues. It may also reflect the fact that most primary teachers (certainly in England and Scotland) tend to be generalists, i.e. teaching all subjects to their own class in a particular year group, whereas most secondary teachers specialise in teaching one (or sometimes two) subject(s). Consequently, secondary teachers of mathematics are more likely to have had time to reflect in depth on the nature of mathematics and its place in the school curriculum, perhaps leading to a greater readiness to challenge myths and discourses such as claims that mathematics is neutral or value-free.

The Primary Maths and Social Justice (PMSJ) research project demonstrated how younger children have the capacity to engage with social justice issues, indeed they often are more passionate about issues of fairness than older children. The project also showed how a participatory action research methodology, based on genuine collaboration between academics and teachers, and between teachers and their colleagues, can provide the mutual support necessary for primary teachers to reappraise their views of mathematics and to enact change in their classrooms. The project demonstrated how encouraging primary students to draw explicitly on the disciplinary knowledge they have learnt in designated mathematics lessons in tackling issues of social justice in cross-curricular projects can have a positive impact on their engagement in mathematics as they begin to view the subject as being more meaningful. Finally, the project highlights the how students can be supported in developing their socio-mathematical agency, which is of critical importance for establishing a humanistic school curriculum that can contribute towards tackling some of the challenges currently facing our society.

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References

Braun, V., & Clarke, V. (2022). *Thematic analysis : A practical guide.* Los Angeles: SAGE.

Gutstein, E. (2016). “Our Issues, Our People - Math as Our Weapon”: Critical Mathematics in a Chicago Neighborhood High School. *Journal for Research in Mathematics Education, 47*(5), 454-504.

Hilton, C., Kelly, J., & Wright, P. (2023). How teaching mathematics for social justice can support inclusive practices in the elementary mathematics classroom. In P. Drijvers, C. Csapodi, H. Palmér, K. Gosztonyi, & E. Kónya (Ed.), *Proceedings of the Thirteenth Congress of the European Society for Research in Mathematics Education (CERME13)* (pp. 4566-4573). Budapest: ERME.

Jerome, L., Liddle, A., & Young, H. (2021). Talking about rights without talking about rights: On the absence of knowledge in classroom discussions. *Human Rights Education Review, 4*(1), 8-26. doi:10.7577/hrer.3979

Kelly, J., Hilton, C., & Wright, P. (2023). Creating space for socio-mathematical agency in the primary classroom. In P. Drijvers, C. Csapodi, H. Palmér, K. Gosztonyi, & E. Kónya (Ed.), *Proceedings of the Thirteenth Congress of the European Society for Research in Mathematics Education (CERME 13)* (pp. 3594-3601). Budapest: ERME.

Skovsmose, O. (2021). Mathematics and crises. *Educational Studies in Mathematics*. doi:10.1007/s10649-021-10037-0

UNESCO. (2015). *Rethinking education: Towards a global common good?* Paris: United Nations Educational, Scientific and Cultural Organisation.

Wright, P. (2021). Transforming mathematics classroom practice through participatory action research. *Journal of Mathematics Teacher Education, 24*(2), 155-177. doi:10.1007/s10857-019-09452-1

Wright, P. (2022). Conceptualising and operationalising socio-mathematical agency. In J. Hodgen, E. Geraniou, G. Bolondi, & F. Ferretti (Ed.), *Proceedings of the Twelfth Congress of the European Society for Research in Mathematics Education (CERME12)* (pp. 1872-1881). Bozen-Bolzano, Italy: CERME. Retrieved from https://hal.science/CERME12/hal-03747841v1

Wright, P., Hilton, C., & Kelly, J. (2023a). Primary school teachers tackling social justice issues whilst teaching mathematics: Findings from the Primary Maths & Social Justice research project. In T. Fujita (Ed.), *Proceedings of the British Society for Research into Learning Mathematics. 43(1),* pp. 1-6. London: BSRLM.

Wright, P., Hilton, C., & Kelly, J. (2023b). *Primary Maths and Social Justice Research Project Report (January 2023).* London: PMSJ Project. Retrieved from https://mathsocialjustice.files.wordpress.com/2023/01/pmsj-report-jan23.pdf

Wright, P., Hilton, C., & Kelly, J. (2023c). The development of socio-mathematical agency. In P. Drijvers, C. Csapodi, H. Palmér, K. Gosztonyi, & E. Kónya (Ed.), *Proceedings of the Thirteenth Congress of the European Society for Research in Mathematics Education (CERME 13)* (pp. 1867-1874). Budapest: ERME.