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# Scottish teachers' perceptions of marginalisation in school mathematics

Constantinos Xenofontos<sup>1</sup> and Sinem Hizli Alkan<sup>2</sup>

<sup>1</sup>Oslo Metropolitan University, Norway; [constantinos.xenofontos@oslomet.no](mailto:constantinos.xenofontos@oslomet.no)

<sup>2</sup>University of Stirling, UK; [sinem.hizliaalkan1@stir.ac.uk](mailto:sinem.hizliaalkan1@stir.ac.uk)

*Several studies highlight significant differences between the mathematical performances of white middle-class boys and several other groups of children with other demographic characteristics. Across different countries, discussions about who is marginalised vary. In Scotland, marginalisation is typically associated with social class and children's socioeconomic backgrounds. In this paper we explore Scottish teachers' perceptions of the causes of marginalisation in school mathematics. 29 teachers from different school levels participated in individual semi-structured interviews. All teachers' responses reflected the social-class discourse of policymakers. Few teachers recognised other marginalising variables (i.e. gender, English language competence) as well. We conclude that the intersectional character of marginalisation needs to be promoted more explicitly in both initial teacher education and continuous professional development programmes.*

*Keywords: Teachers' perceptions, marginalisation, school mathematics, Scotland.*

## Introduction

In recent years, mathematics education has taken a more explicit socio-political turn (Gutiérrez, 2013), by raising and examining questions regarding, inter alia, who decides what is included in school curricula (Appelbaum & Davila, 2007), who gets excluded from school mathematics (Xenofontos, 2015), and how concepts like equity and social justice have their place in the field's discourse (Xenofontos et al., 2021). This paper draws on data from a wider project in Scotland examining teachers' perceptions of marginalisation and equitable teaching practices, as well as teachers' understandings of concepts like equity, diversity, inclusion and social justice in relation to school mathematics. Here, we explore the following research question: *What are teachers' perceptions of marginalisation in relation to school mathematics?* Before we present findings from our work, we turn our attention to the international literature on marginalisation in mathematics education and the importance of transitioning from one school level to another.

## Who is marginalised in mathematics education?

In an initial conceptualisation of equity, Gutiérrez (2002, p. 153) envisioned a stage at which mathematics education stakeholders would be

unable to predict student patterns (e.g., achievement, participation, the ability to critically analyze data or society) based solely on characteristics such as race, class, ethnicity, sex, beliefs and creeds, and proficiency in the dominant language. Being unable to predict mathematics patterns based solely on certain student characteristics addresses issues of power. Rather than expecting that mathematics reform will lead to middle-class White men falling out of power only

to be replaced by another group (e.g., students in poverty, Black women), an equitable situation is when no group oppresses another.

Sadly, the current reality is still far from such a stage. Several studies, typically from North America and many European countries, indicate large discrepancies between the mathematical performances of white male middle-class pupils (the so-called dominant group) and pupils from marginalised groups. These groups include, but are not limited to, girls (Stoet & Geary, 2018), LGBTQI+ children (Leyva, 2017), those whose home language is other than that of school and instruction (Chronaki & Planas, 2018), children with intellectual, emotional, and kinaesthetic disabilities (Watson & Gable, 2012), and those from low socioeconomic backgrounds (Gates, 2019). In fact, things become more complicated when marginalising variables are considered in intersectional manners, like, for instance, the intersection of gender and race (for example, Joseph et al., 2019, write about black girls and their struggles in the white, patriarchal structures of mathematics education).

It appears that different countries and educational systems, not least at the level of policy-making and research, adopt specific lenses through which marginalisation in school mathematics is examined (Graven, 2014; Xenofontos, 2019). In the US, the focus is almost exclusively on race and ethnicity, specifically in relation to the Black and Latinx communities; in several European countries (i.e. Spain, Cyprus) these issues are typically approached in relation to immigration and other-language learners, while in China and many Latin American countries discussions mainly revolve around rurality. In the UK, marginalisation is typically seen through a social-class lens (Gates, 2019), with Scottish policies being no exemption. Specifically, the Scottish educational system explicitly uses the term *poverty-related attainment gap* (Scottish Government, 2018), to describe discrepancies regarding performances and participation rates between pupils who live in economic deprivation and those from affluent backgrounds. To identify the extent to which an area is deprived, the Scottish Government uses measures across seven domains (income, employment, education, health, access to services, crime, housing), and calculates a relative measure of deprivation, called the Scottish Index of Multiple Deprivation (SIMD). All areas in Scotland are given an integer SIMD value, from 1 (most deprived) to 10 (least deprived). Schools receive direct additional financial support, based on how many children from low SIMD's attend each school.

### **Transitioning from one school level to another**

Studies around the world indicate that, as children transition from one school level to another, there is a general decline in their engagement with mathematics (Martin et al., 2015), a decline of their self-efficacy beliefs, motivation, and performance (Deieso & Fraser, 2019), and a reinforcement of stereotypes regarding gender-based mathematics performance (Denner et al., 2018). These observed differences are typically attributed to factors such as teachers' self-efficacy beliefs (Midgley et al., 1989), teachers' and parents' emphases on goal (Friedel et al., 2010), as well as teachers' different approaches in using instructional materials (Fan et al., 2013).

The Scottish Government (2016) makes clear that central to its political agenda is to “improve educational outcomes in communities with a high concentration of children living in poverty” (p. 25); therefore, “[e]nsuring effective transitions between primary and secondary education is

particularly important” (p. 14), especially for children from less affluent backgrounds. A deeper understanding of the extent to which teachers’ perceptions converge or diverge will help us pinpoint continuities and discontinuities in children’s lived school experiences, and consider how to better celebrate or address them.

## **Methodology**

### **Participants**

The General Teaching Council of Scotland (GTCS), the body responsible for teacher registration, registers teachers either as primary or secondary ([www.gtcs.org.uk](http://www.gtcs.org.uk)). Primary teachers are generalists and work with students of ages 3-12, in nurseries and primary schools. Anecdotally, some primary teachers self-identify as early-years teachers, due to their preference of working with children of ages 3-7. Those using the primary teacher label prefer working with children of ages 7-12. Secondary teachers teach their specialist subject area and work with students of ages 12-18.

Participants in this study were teachers working in the Central Belt of Scotland, a large region with areas of different affluence levels, but also with those areas with the lowest SIMDs in the whole country. Volunteer teachers were sought via the networks of local authorities, our own professional networks, and on social media. Teachers who expressed interest passed the details onto other potential participants, in the form of snowball sampling. In total, 29 teachers were recruited, 8 of whom identified as early-year teachers (EY), 11 identified as primary teachers (PT), while 10 were secondary mathematics teachers (ST). Other than one teacher in early-years, two primary and one secondary, all other participants had more than five years of professional experience.

### **Data collection and analysis**

All participants were invited to an individual semi-structured interview. Each interview was audio-recorded, lasted approximately 45-55 minutes, and was held at each participant’s school. As part of a wider project, the interview protocol included questions about teachers’ perceptions of and experiences related to (a) marginalisation and the attainment gap in mathematics, (b) equitable mathematics teaching practices, and (c) concepts like equity, inclusion, diversity, and social justice. Below, we present some sample questions, to give a sense of the interviews’ content:

1. As you may be aware, here in Scotland there is extensive discussion on the *attainment gap*, especially in mathematics/numeracy. How do you understand this attainment gap?
2. Could you give any examples from your own professional experiences where you observed gap(s)? How does it impact your day-to-day life as a mathematics teacher?
3. Why do you think some children do not perform as well as others in school mathematics? Why are some children sent to the margins?

A thematic data analysis was employed. Following Braun’s and Clarke’s (2021) suggestion, we moved away from a need to achieve data saturation; we rather aimed at dwelling “with uncertainty and recognise that meaning is *generated* through interpretation of, not excavated from, data” (p. 201). Due to the exploratory nature of this study, no predetermined coding scheme was utilised. The two authors worked separately and together, to generate codes and later collate them to generate

themes, in similar ways, grounded theorists discuss moving from open to axial coding (Scott & Medaugh, 2017). As a result of focusing on the richness of our data, and not data saturation, we were not particularly interested in quantitative measures (i.e. frequencies, percentages, number of respondents) in presenting our themes. Instead, we followed a phenomenographic approach. Phenomenography explores variation in the ways a phenomenon is perceived by a group of people (Cope, 2004), by taking a second-order perspective, mapping people's experiences and attempting to see the world through the eyes of those experiencing it (Marton, 1981).

## **Findings**

Data analysis brought to surface two themes related to teachers' perception about the causes of marginalisation. Specifically, all participants talked about social class as the main marginalising variable in school mathematics, while very few made scatter references to other variables. Below, these themes are presented in more detail.

### **Social class as the main marginalising variable**

A great homogeneity was observed regarding what teachers distinguished as the main marginalising variable for children's participation and attainment in mathematics. In ST9's words, "students from more affluent households are more willing to give things a go, perhaps get it wrong, mess it up a bit" compared to their classmates from deprived areas. Using vocabulary that reflected national policies, *all* 29 teachers across the three school levels referred to poverty, low socioeconomic status, and SIMDs. Some representative examples are presented below:

"I suppose the attainment gap reflects the, I don't know what you would call it, the affluence gap. I don't know. Monetary gap. Economic gap. In my experience, they have reflected each other almost identically." (ST7)

"The school that I teach in has a lot of pupils from low SIMDs. Most of the children are level 3 in the indication mark-up. There's a high level of students who get free school meals and as a result, our school gets quite a lot of funding from the National Improvement Framework. [...] And a lot of parents are proud, they don't want to tell you that they're struggling or whatever. But you're aware that these children are not getting proper meals." (PT2)

Nevertheless, some participants emphasised the important role of teachers and schools in addressing all children's learning needs as they navigate through the challenges caused by poverty. The quotes below are representative of an early-years teacher and a secondary mathematics teacher:

"What's really nice about the nursery here is that I've seen children really flourish, who come from a really poor background, a really poor housing area and yet they are doing absolutely fabulous work in the nursery just because the educators have got the right way of doing things with them and give the right direction, if you like." (EY1)

"We're certainly not a school that feels sorry for itself and where we're situated. [...] We know where the school is situated, we know the catchment area, the SIMD values, but that's it. Nothing is mentioned beyond that. [...] We're a school that strives to be the best, it doesn't matter where we are. [...] A lot of it comes from leadership, from the staff but often the

pupils, too. If there are discrepancies in behaviour or homework, then they are minorities. They understand that that's not how you're expected to behave here. That's not the standard that we expect from you." (ST10)

In summary, teachers' responses put poverty and socioeconomic status at the center of their perceptions of the causes of marginalisation. This is, in a way, unsurprising, as it reflects the adoption of a social-class perspective on marginalisation in education expressed by UK policies in general (Gates, 2019) and Scottish policies in particular (Scottish Government, 2018).

### **Scatter references to other variables**

Few references were made by teachers across school levels about other marginalising variables. These can be grouped in two broad areas. The first concerns *family-related issues/dynamics*, like parents' lifestyles, family structures, and family-school relationships. According to PT6, typically "we consider poverty as an indicator, but for some children why they are not attaining has nothing to do with poverty", therefore, "what's most important is the school's knowledge of children's families". From this perspective, teachers pointed out that low attainment can be a result of "the chaotic lifestyles that some families have" (EY1). As EY3 commented, "I've seen parents' anxiety and mental health be so prevalent that they won't allow their child to go to school because they can't be without them".

The second area is related to students' *individual differences*, such as gender, disability, English language competence, and other developmental issues. PT8, for instance, pointed out mathematical difficulties faced by children with English as Additional Language (EAL). In her own words, "I've got children who are in that gap because they're EAL. They can literally do their simple  $1 + 1$ , but they can't do word problems". Likewise, ST3, a female secondary teacher, discussed many girls' low confidence as opposed to that of their male classmates:

"I feel like girls have a very low confidence of maths and they don't want to put an answer down because they don't want it to be wrong. [...] Boys are overly confident and therefore don't study and do worse than they should do, and girls have very low self-esteem, get very anxious and don't want to attempt." (ST3)

Interestingly, most references to family-related issues were made mainly by early-years and primary teachers, while discussions of students' individual differences were made by primary and secondary teachers. This move from socio-cultural to cognitive/affective concerns appears to be in accordance with general trends of mathematics education research on transitioning from one school level to another. For example, many recent studies examining transitioning from pre-school or kindergarten to elementary school focus on the impact of family-related factors (i.e. Niehues et al., 2021). Conversely, recent studies focusing on the elementary-secondary transition are typically more interested in cognitive/affective issues and students' individual differences (i.e. Cantley et al., 2021).

### **Conclusions**

In a sense, it was not surprising that *all* 29 teachers in our study pointed out that social class, poverty, and pupils' socioeconomic status constitute variables associated with pupils' mathematical

performance and participation. On the one hand, we consider the fact that few teachers talked about other marginalising variables (e.g. gender, English language competence, disability) encouraging, as those teachers demonstrate some awareness that reality is more complicated than focusing exclusively on social class. Nevertheless, we are aware that simple references to other variables do not necessarily mean that teachers approach marginalisation from intersectional perspectives. As several studies inform us, many teachers have social and political intuition; they sense the interplay between school mathematics and political issues, but do not always know how to put intuition into practice in ways that help their students (de Freitas & Zolkower, 2009; Xenofontos, 2016). Our findings stress an urgency for more intersectional approaches in examining marginalisation in mathematics education, something that could originate from research in teacher education (both initial teacher education and continuous professional development), aiming at having an impact on policy-making, teachers' practices, and students' lived school experiences. Besides, as Freire's (1970) writings have taught us over 50 years now, instead of wait for systemic changes to happen "miraculously", those of us involved in education and share values of equity and social justice could start by initiating small projects in their immediate professional environments.

To conclude, our findings concur with ongoing calls for employing more intersectional approaches, and critical and nuanced discussions on how inequities and marginalisation are constructed and/or even normalised in mathematics education. Intersectionality, as an analytic framework, allows scholars in different fields to explore, inter alia, the structural interplay of variables such as race, class, gender, sexuality, and disability. Yet, we need to acknowledge that we cannot always capture social experience with a finite number of marginalising variables, to describe the intersectional identity of a person (Appelbaum, 2002). At best, we can have an approximation based on important characteristics of how identity is read by others in a social situation. Teacher education initiatives should be designed to address more sophisticated understandings of concepts like marginalisation, equity, and social justice. Hence, mathematics teacher education, we believe, must challenge the current simplistic understanding of marginalisation and provide targeted support to teachers so to rethink their narratives around practices that aim at helping children regardless of background.

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