



## “They’re coming into school hungry, they’re not ready to learn”. Scottish teachers’ perceptions of marginalization in school mathematics

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### Abstract

In recent years, many studies have highlighted significant differences between the mathematical performances of white middle-class boys and several other groups of children with other demographic characteristics. The ways teachers perceive marginalization influence how they make sense of diverse classrooms and how they can actively support pupils from marginalized backgrounds. Discussions about who is marginalized in school mathematics vary across different countries. In Scotland, not least at the level of policymaking, marginalization is typically associated with social class and children’s socioeconomic backgrounds. The main aim of this paper is to explore Scottish teachers’ perceptions of the roots of marginalization in school mathematics. Participants were 29 teachers from different school levels (eight early-years, 11 primary, and 10 secondary teachers). Drawing on data from individual semi-structured interviews, our thematic analysis indicated that teachers’ responses mainly reflected the social-class/poverty discourse of policymakers, while very few recognized other marginalizing variables (for example, gender, English language competence). Yet, none of the teachers talked about how such variables may be interlinked. In conclusion, the intersectional character of marginalization (structural interplay of variables such as race, class gender, sexuality, disability etc.) needs to be promoted more explicitly in initial teacher education and continuous professional development programs.

**Keywords:** marginalization, school mathematics, Scotland, teachers’ perceptions

### INTRODUCTION

In many societies, individuals or groups of people sharing certain observable characteristics and/or practices beyond what is perceived as the “norm” are often marginalized: they lack visibility, experience social exclusion, and are denied access to opportunities. Such examples include, inter alia, issues related to race and ethnicity (Wigerfelt et al., 2014), social class (Blome et al., 2019), gender, gender identity, and sexual orientation (Nygren et al., 2018; Schwarz & Britton, 2015), and disability (Darcy et al., 2020).

Drawing on data from a wider project in Scotland, this paper focuses on teachers’ perceptions of observable characteristics that may explain why some children underperform in school mathematics. Specifically, we seek answers to the following research question: “What are Scottish teachers’ perceptions of marginalization in school

mathematics”. Examining such perceptions is of high importance, as they influence how teachers make sense of diverse classrooms and how they actively support pupils from marginalized backgrounds (Feen, 2012; White & Murray, 2016; Xenofontos, 2015, 2016).

In the following sections, we first turn our attention to the international literature on marginalization in school mathematics. We continue by providing readers with some general information about the Scottish context, so that local/cultural particularities can be better understood. Subsequently, we present our research design, data collection and analysis, as well as findings related to our research question. At the end, we discuss our findings and make some suggestions for teacher education and future research.

### **Contribution to the literature**

- This paper provides evidence indicating that teachers reproduce the discourse of policymakers as far as marginalization in mathematics education is concerned.
- We discuss the importance of approaching marginalization from intersectional perspectives in initial teacher education.
- We also discuss the importance of approaching marginalization from intersectional perspectives in continuous professional development programs.

## **MARGINALIZATION AND SCHOOL MATHEMATICS**

Studies, typically from North America and many European countries, indicate large discrepancies between the mathematical performances of white middle-class pupils (so-called dominant group) and pupils from marginalized groups. These groups include, but are not limited to, girls (Foy et al., 2018; He et al., 2020), LGBTQI+ children (Leyva, 2017; Rands, 2013), children from ethnically minoritized groups (Martin, 2019; Martin et al., 2015; Tabron et al., 2021), those whose home language is other than that of school and instruction (Chronaki & Planas, 2018; Moschkovich, 2018), children with intellectual, emotional, and kinesthetic disabilities (Cascales-Martínez et al., 2017; Watson & Gable, 2012), and those from low socioeconomic backgrounds (Chiu, 2018; Gates, 2019). In fact, things become more complicated when we consider marginalizing characteristics in intersectional manners (McLeman & Vomvoridi-Ivanovic, 2012; Pruitt et al., 2019). Stemming from the work of Crenshaw (1989), intersectionality, as an analytic framework, allows scholars in different fields to explore 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 marginalizing characteristics, to describe the intersectional identity of a person (Appelbaum, 2002; Garry, 2011). At best, we can have an approximation based on important characteristics of how identity is read by others in a social situation. From this perspective, Joseph et al. (2019) and Leyva (2021), for example, write about black girls and their struggles in white, patriarchal structures of mathematics education.

It appears that different countries and educational systems adopt specific lenses through which marginalization in school mathematics is examined (Graven, 2014; Xenofontos, 2019). In the USA, the focus is almost exclusively on race and ethnicity, specifically in relation to the Black and Latinx communities; in several European countries (e.g., 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, marginalization is typically seen through a social-class lens (Gates, 2019), with Scottish policies being no exemption (Swanson et al., 2017).

## **THIS STUDY**

### **The Scottish Context, Policies and Practices**

In the UK, education is a devolved matter, with four autonomous educational jurisdictions (England, Northern Ireland, Scotland, and Wales). Following international reform trends (Sinnema & Aitken, 2013), Scotland's education system witnessed a major curriculum change in 2010 with the launching of the Curriculum for Excellence, for both Broad General Education (ages 3-15) and Senior Phase (ages 15-18), which are both state funded as part of comprehensive education system. 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 pupils 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 pupils of ages 12-18.

The Scottish educational system explicitly uses the term poverty-related attainment gap (Education Scotland, 2018; Ellis & Sosu, 2015; Scottish Government, 2016, 2017), 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 (2016, 2017) 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).

Along with literacy and health-and-wellbeing, mathematics/numeracy is identified as a priority curriculum area in need to address the attainment gap (Education Scotland, 2018). Closing such a gap has become a top national priority from 2015, with the introduction of the Scottish Attainment Challenge (Education Scotland, 2018). The Scottish Government (2016) makes clear that "[e]nsuring effective transitions

between primary and secondary education is particularly important" (p. 14), especially when "[t]he Scottish Attainment Challenge has been set up to improve educational outcomes in communities with a high concentration of children living in poverty" (p. 25). Current actions related to this national attempt include the Pupil Equity Funding (an additional funding allocated directly to schools, based on the number of pupils from low SIMDs attending them) and Getting It Right for Every Child (national approach to improving outcomes and supporting the wellbeing of children, young people, and their parents). Also, in the GTCS's (2021) revised professional standards, attention is placed on equity and social justice, which are seen as core teacher values, although these terms are used without being clearly defined.

### Participants

Participants were teachers working in the Central Belt of Scotland. Even though this is a large region with areas of different affluence levels, it also includes areas with the lowest SIMDs in the whole country. Participating teachers were sought via the networks of local authorities, our own professional networks, and on social media. Also, teachers who voluntarily expressed interest in the project passed the details onto other potential participants, in the form of snowball sampling (Creswell & Clark, 2017). In total, 29 teachers were recruited, eight of whom self-identified as early-year teachers and 11 as primary teachers, while 10 were secondary mathematics teachers. Other than one teacher in early-years, two primary and one secondary, all other participants had more than five years of professional experience. The five-year threshold is often seen as a critical time frame during which teachers have had sufficient time to develop a wide range of professional experiences (Graham et al., 2020). In this paper, generalizing our findings to the wider teacher population of Scotland is neither desirable nor productive. Our interpretations are, rather, framed by our subjective point of view, which nonetheless we attempt to justify with the support of relevant literature.

In the presentation of our findings, we refer to each of the 29 participants by their school level and assigned number (e.g., EY3-3rd early-year teacher, PT2-2nd primary teacher, ST7-7th secondary teacher).

### Data Collection and Analysis

All participants were invited to an individual semi-structured interview. Each interview was audio-recorded, lasted approximately 45-55 minutes, was held at each participant's school, and was conducted by either one of the two authors or a research assistant. As part of a wider project, the interview protocol included questions about teachers' perceptions of and experiences related to (a) marginalization and the attainment gap in

mathematics, (b) equitable mathematics teaching practices, and (c) concepts like equity, inclusion, diversity, and social justice. Since several policy documents in Scotland emphasize the term "attainment gap", we took this opportunity to initiate discussions with teachers. The following sample questions are presented to give readers 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?

Since the interviews were semi-structured, not all questions were posed in the exact same order or phrasing to participants. In fact, several questions from the interview protocol were omitted in cases where they were covered by responses to other questions. The protocol was prepared in advance, to support researchers in cases where the discussion got stuck or lost its flow. All interviews were transcribed verbatim soon after they had been conducted.

In recognizing that perspectives, meanings, and experiences are constructed within their unique contexts and under certain sociocultural conditions (Xenofontos, 2018), a reflexive thematic analysis (Braun & Clarke, 2021) was employed, following the six phases below:

1. **Familiarization:** Both authors read all transcripts independently, staying open to interesting insights. We later shared our perspectives and meaning-making on the data.
2. **Generating codes:** Keeping our research questions in mind, we chose 14 transcripts (four from early years, six from primary, and four from secondary teachers) and worked independently, assigning codes to different quotations. While this number is typically considered adequate for data saturation (Guest et al., 2006), our decision was made for practical reasons. Besides, Braun and Clarke (2021, p. 201) encourage researchers to move away from a need to achieve data saturation in qualitative analyses, and to "dwell with uncertainty and recognize that meaning is generated through interpretation of, not excavated from, data". Due to the exploratory nature of this study, no predetermined coding scheme was utilized. The 14 interviews were approached as a single data set, meaning that we did not conduct separate analyses for each school level. We based this decision on the hypothesis

that if teachers within a school level shared homogeneous perspectives then that would be reflected at the next stage, when themes would be constructed. Soon after completing coding, we discussed our emerged codes and several controversial cases.

3. **Constructing themes:** We collated some of the codes to answer our research questions most insightfully and effectively; in similar ways, grounded theorists discuss moving from open to axial coding (Strauss & Corbin, 1998). We subsequently divided the remaining interviews between both authors. Each of us read the transcripts identifying quotes for each of the themes that had emerged during the previous phase. Even though we were not aiming for data saturation (Braun & Clarke, 2021), we agreed that our themes could tell a coherent story.
4. **Reviewing themes:** To increase the degree of trustworthiness of our work (Lincoln & Guba, 1985), we used peer scrutiny for our initial themes, by sharing them with "critical friends" (Baskerville & Goldblatt, 2009), Scottish colleagues in academia. In cases where clarifications were needed, we revised our themes accordingly.
5. **Defining and naming themes:** We discussed the labelling of the themes, aiming at providing a clear and coherent story for the readers. Again, we received feedback from "critical friends" and made necessary amendments.
6. **Writing up:** 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.

The study complies with the ethical guidelines of the British Educational Research Association (BERA, 2018). To safeguard confidentiality and traceability issues, no names of teachers, pupils, or schools are mentioned.

## FINDINGS AND DISCUSSION

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

### Social Class as the Main Marginalizing Variable

A great homogeneity was observed regarding what teachers distinguished as the main marginalizing variable for children's participation and attainment in mathematics. Using vocabulary that reflected national

policies, all 29 teachers across the three school levels referred to poverty, low socioeconomic status, and SIMDs. For example, PT2 described a picture of their school using Scottish policy frameworks to address the poverty-related attainment gap:

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. [...] We have got a lot of children that are dependent on food banks, a lot of children that are dependent on clothing banks. 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. They're coming into school hungry, they're not ready to learn (PT2).

Similarly, ST7 made a direct link to affluence and students' attainment levels in mathematics, by arguing that

"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."

Nevertheless, some participants emphasized 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 behavior 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 regarding the causes of marginalization. This is, in a way, unsurprising, as it reflects the adoption of a social-class perspective on marginalization in education expressed by UK policies in general (Gates, 2019) and Scottish policies in particular (Education Scotland, 2018; Ellis & Sosu, 2015; Scottish Government, 2016, 2017). Also, the fact that some participants highlighted their own responsibilities in supporting children in poverty to learn mathematics is encouraging, as it recognizes teachers' agency (Biesta & Tedder, 2007) and their central role in the promotion of equity and social justice through school mathematics (Xenofontos, 2019).

### Scatter References to Other Variables

Few references were made by teachers across school levels about other marginalizing variables beyond social class. These can be grouped in two broad categories. The first category concerns family-related issues, while the second is related to pupils' individual differences. Interestingly, most references to family-related issues were made mainly by early-years and primary teachers, while discussions of pupils' individual differences were made by primary and secondary teachers. This move from sociocultural 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 primary school focus on the impact of family-related factors (Niehues et al., 2021). Conversely, recent studies focusing on the primary-secondary transition are typically more interested in cognitive/affective issues and pupils' individual differences (Deieso & Fraser, 2019). We shall unpack each and provide illustrative examples from teachers at different sectors.

#### *Family-related issues*

Family-related issues involved families' cultural capital, parents' mental health, parents' lifestyles, family structures and family-school relationships. For example, both EY1 and EY3 talked about the importance of healthy relationships between children and parents, and their common engagement in non-formal activities, such as a visit to the supermarket or baking at home:

Some parents are just not aware of where the child needs to be and how to bring that on. Sometimes the conversation has to be about, you know when you're out with your child, "have you looked at the buses, have you got your child to say, there's a number on the bus". Or when you're at the supermarket have you counted because they don't really realize that (EY1).

We do a lot of experiential things. If you've had a family that's well off and you've done a lot baking at home, a lot of weighting, and a lot of those skills, you do see the kids come in that have had more interaction with adults and have done that kind of stuff, and they are more confident when it comes to doing numbers and maths (EY3).

According to PT9, providing a settled home "where children feel nurtured, safe and secure doesn't require money" and "makes a big difference to how ready they [note: children] are to learn, and how able they are to engage". Similarly, referring to the case of a boy whose parents were getting a divorce, PT3 commented on how arguments between the parents at home had a negative impact on the boy's behavior and prevented him from focusing on his mathematics learning:

He acted out in the classroom all the time, and was very very disruptive in class but when you look at what's behind and the battles that he was actually struggling with as a little person, because he was only little, it's awful. You know it's terrible that people have to live in those circumstances. And actually, numeracy is not their priority because their priority is survival (PT3).

Parents' mental health was indicated as another factor that may impact pupils' mathematical attendance, performance, and progression in school subjects, including mathematics. From this perspective, teachers pointed out that low attainment can be a result of "the chaotic lifestyles that some families have" (EY5). As EY7 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."

Another important variable was the family-school relationship and the frequency and quality of these relationships. According to PT9, 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". Although these quotes indicate a range of variables to understand the attainment gap, there is still a lack of emphasis on how different variables might intersect in creating marginalization in mathematics education.

#### *Pupils' individual differences*

The individual differences included pupils' aspirations, self-esteem, gender, and additional support needs. One of the repeated causes of the attainment gap in numeracy, especially by secondary school teachers, was about pupils' confidence levels. As ST9 claimed,

"a massive one is confidence with our pupils. What I found throughout my teaching career is that willingness to have a go, or the resilience to go ahead can be very low a lot of the times and sometimes you'll see it in class."

ST3, a female secondary teacher, also talked about pupils' confidence, which she associated with gender. Specifically, she 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".

Few teachers talked about physical disabilities and learning difficulties some children might face, such as dyslexia, dyscalculia, attention deficit hyperactivity disorder, and visual impairment. ST4, however, argued that many times pupils with such disabilities/difficulties choose not to engage with the available support:

There are some pupils where I see them and I know that they have some disabilities and they are struggling, I can clearly see this, because of that. Whereas there are other pupils who struggle when you look at their attainment but it's not because of their difficulties but because they choose not to engage with the support that's being provided to them. There are a number of pupils who are supposed to be using ICT to help them or they're supposed to be using overlays in their work and they just choose not to do that. So they are actively making that decision not to use the support that's available or to not engage with the class teacher and then they'll turn around and say "it's because I'm dyslexic". For me, no it's not (ST4).

Finally, PT8 commented that children with English as an additional language (EAL) face difficulties in understanding mathematics when presented in verbal contexts. 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."

## CONCLUSION

As discussed at the beginning of this paper, different countries and educational systems adopt specific lenses through which equity issues, marginalization and so-called attainment/achievement gap(s) are examined (Graven, 2014; Xenofontos, 2019). In the UK in general

(Gates, 2019), and Scotland in particular (Education Scotland, 2018; Ellis & Sosu, 2015; Scottish Government, 2017; Swanson et al., 2017), it is typical for discussions at the level of policymaking to associate marginalization with poverty, social class, and socio economic status. In a sense, it was not surprising that all 29 teachers in our study pointed out that these factors are associated with pupils' mathematical performance and participation. Participants' perceptions, in fact, reflected the discourse of Scottish policies. It is, therefore, quite possible that teachers' professional judgements are overly persuaded by the policy rhetoric rather than academic research findings. On the one hand, we consider the fact that few teachers talked about other marginalizing 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. On the other hand, we are aware that simple references to other variables do not necessarily mean that teachers approach marginalization from intersectional perspectives.

Studies from different cultural/educational contexts inform us that 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 pupils (de Freitas & Zolkower, 2009; Xenofontos, 2016). Our findings stress an urgency for more intersectional approaches in examining marginalization 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 policymaking, teachers' practices, and pupils' lived school experiences. These issues are highlighted by colleagues who wrote about general teacher education (see for example, Heinz et al., 2021; Powers & Duffy, 2016; Pugach et al., 2019). Nevertheless, to the best of our knowledge, this is an unexplored area for mathematics teacher education and related research. As Freire's (1970) writings have taught us over 50 years now, instead of waiting 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 marginalization are constructed and/or even normalized in mathematics education. Teacher education initiatives should be designed to address more sophisticated understandings of concepts like marginalization, equity, and social justice. Hence, mathematics teacher education, we believe, must challenge the current simplistic understanding of marginalization and provide targeted support to

teachers so to rethink their narratives around teaching practices that aim at addressing marginalization.

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