AN IDEOLOGICAL PERSPECTIVE ON INCLUSIVE MATHEMATICS EDUCATION FOR ALL STUDENTS

Every single child is a mathematician and possesses the capability to grasp mathematical ideas from the beginning of life. Students' performance in mathematics continues to be a focus of educational research globally. Despite curricular reforms promoting inclusivity, disparities in performance, attitudes, and dispositions remain, highlighting the need to consider factors influencing mathematical learning for all students. This paper provides a narrative review of the literature on inclusive mathematics education (IME) from an ideological perspective that explores growth and fixed mindset, mathematics anxiety, and school structure. There is reference to the Irish context and its pedagogical implications from this ideological perspective, highlighting gaps in the literature and offering guidance for future research and strategies to support inclusive teaching practices for teachers and school leaders.

Keywords: Inclusive mathematics education, mathematics education, growth and fixed mindset, ability grouping, mathematics anxiety.

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INTRODUCTION

Inclusion holds a central position in mathematics education research (Askew, 2015). Recent research has highlighted multiple interacting factors associated with mathematics achievement (Wang et al., 2023) underscoring the importance of holistic approaches to inclusion. Although inclusion is widely understood as a multidimensional concept, inclusive mathematics education (IME) is rarely examined through the same lens. Roos (2019) claims that inclusion in this context is often treated as two distinct, one-dimensional complexes, as an ideology and a pedagogy. It is noted that there is a gap between both discourses in the literature; however, Roos (2019) argues that in order to foster sustainable inclusion in mathematics, there must be an interconnectedness between the two domains.

The basis of inclusive education has been described as 'Education for All' (United Nations Educational, Scientific and Cultural Organisation (UNESCO), 2005, p. 9). However, there have been arguments that have described mathematics as a subject that 'is not for all' (Pais, 2014, p. 1091). This perspective attempts to dismantle the idea that universal success in the subject is possible and emphasises that the social structure of school will always be selective and embed exclusion (Pais, 2014). Although this argument provides stimulus for further study, this theoretical critique is limited in its focus from an economic and political perspective, and lack of empirical evidence. The evidence supporting inclusive education, from both a general and mathematical perspective, is strongly optimistic (Cosier et al., 2013; Faragher et al., 2016; Kefallinou, 2020). However, it is important to acknowledge that the purpose of IME extends beyond the mere pedagogical implications. In line with the ideological perspective of IME, it is impossible to deny that every person has a right to a meaningful and quality education, and that is the fundamental purpose and outcome of inclusive education (UNESCO, 2005). Thus, the goal of IME is to ensure that every learner has access to mathematics in ways that respect their rights, dignity, and identity; challenging systemic exclusion and promoting participation.

INCLUSIVE MATHEMATICS EDUCATION AS AN IDEOLOGY

The ideological narrative of mathematics education has received considerable attention in academic literature (Roos, 2019). This ideological perspective encompasses the sociological issues that impact students' mathematics educational experiences and engagement, including issues of gender, mindset, perspectives and attitudes (Cribbs et al., 2021; Lindberg et al., 2010). In the realm of IME research, this sociological perspective has been documented as more prevalent in comparison to the pedagogical interventions (Roos, 2019). Pierre Bourdieu's concept of 'habitus' serves as a cornerstone in sociological theory, and it can be defined as a collection of 'durable' and 'transposable' dispositions that an individual has (Bourdieu, 2004, p. 107). These can manifest through enduring patterns of behaviour, perception, and 'feeling and thinking' (Bourdieu, 1990, p. 70). This paper examines the ideological implications for students within the context of IME. This will be reflected in the discussion of students' perceptions, including their feelings and thoughts, as seen through growth and fixed mindsets, the development and impact of mathematics anxiety, and the impact of school structure. These three areas have been selected for this paper as they provide complementary perspectives of dispositions and experiences of students in mathematics, drawing on Bourdieu's (1990, 2004) concept of habitus to understand how students' attitudes and behaviours are shaped by social and educational contexts.

Growth and Fixed Mindset

Dweck's (2006) conceptualisation of growth and fixed mindset is a heavily documented phenomenon in student learning. This idea centres on how students perceive learning, and whether they view ability as an inherent, unchangeable trait, or as something that can be developed. Students with a fixed mindset often prioritise proving their intelligence rather than focusing on its development. This perspective is shown to impact their behaviour, as seen in their tendency to avoid challenging tasks and exhibit lower persistence, resulting in academic underachievement (Yeager & Dweck, 2012). In contrast to this, students with a growth mindset are more likely to embrace challenges, viewing them as opportunities to improve their abilities and enhance their competence (Dweck, 2006; Yeager & Dweck, 2012).

It has been argued that the prevalence of fixed mindsets in mathematics education contributes to the persistence of inequities in attainment and participation. Teaching methods within mathematics classrooms, alongside entrenched societal beliefs about mathematics ability, are argued to reinforce the idea that mathematical competence is an innate gift rather than a skill that can be developed (Boaler, 2015). Mathematics has been characterised as a subject in which students are particularly prone to developing fixed mindsets (Blackwell et al., 2007; Boaler, 2015). This may be linked to the nature of mathematics learning itself, which often requires challenge and struggle to develop understanding (Warshauer, 2015). Such beliefs, which can be transmitted both in educational settings and within the home (Gunderson et al., 2012; Yeager, 2022), risk perpetuating the view that some individuals are naturally good at mathematics while others are not, which may discourage effort, persistence, and the cultivation of mathematical identity.

Research has documented fixed mindset as a barrier to reducing inequalities in mathematics education, especially concerning gender. Heyder et al., (2020) examined the influence of beliefs in fixed, innate ability in mathematics and language arts among German post-primary students (n = 423). Specifically, the study investigated the extent to which such beliefs shaped students' ability self-concept and intrinsic motivation. The findings revealed that endorsing beliefs in innate mathematical ability was associated with lower ability self-concept and reduced intrinsic motivation among girls, whereas no such relationship was found for boys. By contrast, no association was observed between fixed beliefs about language arts ability and either ability self-concept or intrinsic motivation for either gender. These results suggest that fixed mindset may pose a particular burden for girls in mathematics, reinforcing existing gendered inequities in this subject.

Such beliefs about mathematical ability have been shown to influence performance in the subject. Stankov and Lee (2017) reported that students' self-beliefs were associated with mathematics outcomes, with positive self-beliefs linked to improved cognitive performance. This evidence supports the potential value of implementing growth-mindset interventions in schools; however, according to two meta-analyses conducted by Sisk et al., (2018), the outcomes of such interventions produce mixed and weak results. The mixed effects of growth-mindset interventions demonstrates a need to explore alternative approaches for cultivating growth mindset within school settings.

Teachers have been noted to play a pivotal role in the development of growth and fixed mindsets in their students. Yeager et al. (2022) investigated the impact of teachers' own growth or fixed mindsets on their students, analysing data from 9,167 first-year high school students and 223 mathematics teachers. The findings indicate that students are more likely to sustain a growth mindset when their teachers possess a growth mindset and foster a supportive classroom climate (Yeager et al., 2022). Such evidence underscores the influence of adults' beliefs in shaping students' perceptions of their abilities, suggesting that limiting perceptions among teachers or parents can have tangible effects on student outcomes. Indeed, in the Irish context, the National Council for Special Education (NCSE) reports indicate that both teachers and parents are twice as likely to underestimate the mathematical performance of children with Special Educational Needs (SEN) compared to their peers without SEN (Cosgrove et al., 2014). Moreover, these limiting perceptions may extend to gendered assumptions. McCoy et al. (2022) reported that both mothers and teachers systematically under-estimate girls' mathematics performance relative to boys, even when controlling for actual achievement.

Mathematics Anxiety

In the field of mathematics education, a fixed mindset has been linked to the development of an occurrence in students known as mathematics anxiety (MA) (Cribbs et al., 2021), a concept that has occupied an important role in the research of mathematics education in the last two decades (Carey et al., 2016; Dowker et al., 2016). MA has been described as a condition of apprehension when engaging in mathematical tasks (Johnson et al., 2021). MA is noted to encompass multiple dimensions, including cognitive and affective components (Henschel & Roick, 2018). When considering it from this perspective, the cognitive component can represent students' worry and apprehension regarding their ability, performance, and the aftereffects. The affective component reflects the tension and uneasy emotions and feelings that accompany this. Academic literature has highlighted a complex relationship between MA and mathematical skills (Carey et al., 2016), with a common argument describing it as a reciprocal relationship (Jansen et al., 2013). This phenomenon is noted to potentially be impactful from the very beginning of a child's formal mathematics education, with anxiety-related disruptions to memory encoding potentially contributing to persistent gaps in mathematical proficiency (Tomasetto et al., 2021).

Research has indicated that traditional pedagogical practices in mathematics, such as those that prioritise rote memorisation and repetitive, monotonous tasks, contribute to the development of inaccurate and negative perceptions regarding the subject, as well as individuals' own performances and abilities (Frankenstein, 1989). Recent studies have identified a link between MA and the pedagogical approaches employed in mathematics classrooms, indicating that student-centred practices can be beneficial, while teacher-centred approaches alone are unlikely to alleviate MA (Alanzi, 2020; Atoyebi & Atoyebi, 2022). A study conducted by Alanzi (2020) investigated the effect of active recreational mathematics games (ARMG) on first-grade male students. It found that those exposed to ARMG, in addition to traditional methods, reported lower levels of MA and achieved higher performance scores compared to their peers taught solely through traditional methods. This evidence suggests that innovative, play-based strategies may enhance both affective and cognitive dimensions of mathematics learning. Consistent with this, Boaler (2015) identifies the traditional practice of timed testing as a contributing factor to MA. It is argued that under stressful testing conditions, students may struggle to retrieve mathematical knowledge from working memory, which can lead to underperformance and, over time, the development of MA (Beilock & Maloney, 2015; Boaler, 2015).

Certain practices in mathematics education within the Irish system may raise concerns regarding their potential contribution to the development of MA. For example, the routine testing of times-tables has long been a recognised feature of Irish primary schools; however, there remains a gap in research investigating its prevalence in practice today and its potential impact on student learning and MA. More broadly, Dunphy (2009) found that infant primary classrooms were predominantly teacher-centred, with whole-class instruction serving as the dominant pedagogical approach. In contrast, recent reforms have introduced a new primary mathematics curriculum, which signals a shift away from traditional practices towards more 'playful and engaging learning experiences' (NCCA, 2025, p. 5), reflecting a positive progression in policy towards practices that may combat MA.

From a post-primary perspective, ongoing debate has focused on the high-stakes examination culture surrounding the Junior Cycle (JC) and Leaving Certificate (LC), which serve as the terminal assessments for students at approximately ages 15 and 18, respectively. These examinations have been shown to contribute to a high-pressure, stress-laden school experience (Banks & Smyth, 2015). The LC is particularly significant as it functions as a key gateway to further and higher education. Within this framework, all students are required to complete a mathematics examination. A minimum pass grade is typically necessary for entry to most institutions, while additional bonus points are awarded to students who sit the subject at Higher Level[1] (HL). This positioning reinforces mathematics as a core subject within post-primary education. There is a gap in literature surrounding the levels of MA experienced by students during their post-primary experience, however, upon the new developments of both JC and LC mathematics over the last decade, there has been research conducted in relation to the methods of instruction in classrooms. Berry et al., (2021) investigated instructional practices in LC HL mathematics classrooms. Their findings indicated that 'direct instruction (chalk and talk)' was the most frequently employed pedagogical approach (p. 137). While the study provides useful insight, it was based on a quantitative survey of 111 teachers, which may not be fully representative of the wider teaching population. Nevertheless, it highlights a gap in the literature concerning pedagogical practices that may contribute to heightened MA during an already stressful and high-stakes period in post-primary education.

Research suggests that certain student cohorts, particularly those with learning difficulties, lower achieving, and female students, may be especially susceptible to MA (Mutlu, 2019; Goetz et al., 2013). Mutlu (2019) conducted a study of elementary school students and demonstrated that MA was more prevalent among students with mathematics learning difficulties and 'low achievers' in comparison to their peers who were 'normal' and 'high achievers' (Mutlu, 2019, p. 472). The impact of this on performance was described as detrimental for these students due to the debilitating effect that MA can have on working memory. Female students are also more vulnerable to the negative impacts of

[1] In the Irish Leaving Certificate, students choose between Higher Level (HL), Ordinary Level (OL), and Foundation Level (FL) for each subject. HL is the most advanced and covers content in the greatest depth, OL covers core material, and FL focuses on essential content. The highest points are awarded for HL, followed by OL, and then FL subjects. At Junior Cycle (JC), the first stage of post-primary education, students can opt to sit the mathematics examination at HL or OL.

MA. Goetz et al. (2013) reported that, despite achieving grades comparable to boys, girls in German post-primary schools exhibited higher levels of trait anxiety and lower self-perceived competence in mathematics.

School Structure

As previously mentioned, Bourdieu posits the argument that through the structures of the social world, perceptions are made (Bourdieu, 1989). This is particularly relevant from an educational perspective, as there has been increasingly more attention given to the school structures in place to effectively implement inclusive education. For example, school structure is noted to have a key influence in the nature of social interactions that take place between students (Richardson, 2002), as students in inclusive schools are more likely to identify themselves as having friends inside and outside of school, and experience healthy social interactions with peers (Bunch & Valeo, 2004; Meyer, 2001). However, the format of school structures has also been argued to result in negative social implications for students, including systems that foster ability grouping (Boaler, 2013; Bracey, 2003).

From a Bourdieusian perspective, ability grouping has been described in academic literature as an act of 'symbolic violence' (McGillicuddy & Devine, 2018, p. 89). Sociologically, symbolic violence refers to the subtle and sometimes unrecognisable forms of domination that may occur in social or cultural norms (Bourdieu & Passeron, 1977). A study conducted in disadvantaged Irish primary schools demonstrated that students are more likely to be ability grouped for mathematics and English (McGillicuddy & Devine, 2018), a common practice also active in a more formal and consistent capacity in Irish post-primary schools (Smyth, 2018). This division can take place for students as early as in their second year of post-primary school, when they, their parents and/or their teacher make the decision for the student to study and be examined at HL or OL mathematics (O'Reilly et al., 2017). Although this is a fundamental structure of the Irish mathematics education system, its influence across various domains remains under-researched, and its true impact is not fully understood.

In mathematics education, the widespread practice of ability grouping has been argued to contribute to students' beliefs that some of their peers are inherently more capable than others, and to foster the perception that such ability is fixed (Boaler, 2005, 2013). However, disregarding whether students' self-beliefs are impacted by this structure, there is evidence to suggest that ability grouping has an impact on mathematics performance and learning experiences. Wiliam & Bartholomew (2004) employed a longitudinal study of 955 students across six schools in London over a four-year period. The findings suggest that ability grouping can lead to significant differences in student progress, with those in higher ability groups, or 'sets', achieving better General Certificate for Secondary Education (GCSE) outcomes compared to peers in lower sets, even when the students had similar prior attainment. However, it is important to acknowledge that the teachers who were assigned lower sets were the least qualified to teach mathematics, had lower expectations of their students, frequently set work that was not challenging for the students, and utilised a 'narrower' range of teaching methodologies (Wiliam & Bartholomew, 2004, p. 290). In contrast, two second-order meta-analyses examining ability grouping over a 100-year period suggest that it can enhance student learning across all ability levels (Steenbergen-Hu et al., 2016). These findings underscore the complex nature of this school structure and its potential to both support and hinder student learning and experiences.

In the Irish context, research has increasingly focused on the supply and qualifications of mathematics teachers in schools. It is estimated that approximately 25% of mathematics teachers in Ireland are 'out-of-field', meaning they are assigned to teach mathematics without holding the corresponding subject specific qualifications (Goos et al., 2023, p. 401). Lane and Ní Riordáin (2020) investigated the professional learning needs of out-of-field mathematics teachers in the Irish context. The study identified significant gaps in participants' mathematical content knowledge, with evidence of conceptual misunderstandings relating to the curriculum they were required to teach. The authors argue that instruction delivered by out-of-field teachers may have an effect on students' mathematical attainment and, by extension, their future learning trajectories.

CONCLUSION

The ideological dimension of IME demonstrates that inclusion extends beyond pedagogical interventions to encompass broader sociocultural factors that impact students' mathematical experiences. In particular, the roles of *Growth and Fixed Mindset*, *Mathematics Anxiety,* and *School Structure* are significant in the implementation of IME for all students.

The concept of Growth and Fixed Mindset underscores the potential implications of fostering growth-orientated beliefs in both students and teachers to enhance learning outcomes for students. Furthermore, MA emerges as a significant barrier to IME, disproportionately affecting students with learning difficulties, low achievers, and female students. The interplay between anxiety, mindset, and pedagogical approaches suggests the need for holistic reconsideration of how mathematics is taught and assessed. High stakes testing and traditional instructional practices may contribute to the persistence of MA, necessitating a shift towards student-centred, inclusive practices that support all learners. Moreover, the role of Higher and Ordinary level grouping, is under-researched, and may have implications on students' learning experiences. The influence of the high number of out-of-field mathematics teachers is also an important facet of the Irish school structure that could affect both teaching quality and student outcomes.

The ideological underpinning of IME challenges the prevailing narrative that mathematics is an exclusionary subject for only a select few. Through critically analysing the interplay between sociocultural and pedagogical practices, this review reinforces the necessity of embedding inclusive ideologies within mathematics education. Future research should investigate teachers' mindsets in relation to mathematics teaching, with particular attention to the intersection of the ideological and pedagogical dimensions of IME within the Irish context. Such inquiry could inform the development of evidence-based strategies that promote meaningful and equitable learning experiences. Additionally, further exploration is warranted into how inclusive practices across mindset, pedagogy, and school structures influence measurable mathematics achievement, ensuring that inclusion and attainment are understood as interconnected rather than competing goals. Ultimately, achieving IME requires a concentrated effort from educators, policymakers, and researchers to dismantle systemic barriers and cultivate a mathematics culture where all students can thrive.

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