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Educators' sensemaking about mathematics equity and ability grouping

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Abstract

Purpose – This study aims to examine how educators in one private prekindergarten through Grade 8 (PK–8) school conceptualized mathematics equity and reasoned about the equity of ability grouping. Sustainable Development Goal 4 (SDG 4) provides the broader context.

Design/methodology/approach – An interpretive qualitative single-case study used semi-structured interviews with 11 educators, supplemented by the school's equity document and one participant-confirmed field note. Analysis combined in vivo and provisional coding with cross-participant comparisons. Sensemaking and mental models served as analytical lenses; the National Council of Teachers of Mathematics' conception of mathematics equity provided the conceptual foundation; and a meso-level framing located the analysis at the school level.

Findings – Most participants defined equity as meeting individual needs and drew on overlapping evidence sources but emphasized different indicators when reasoning about need and readiness. They also differed in what counted as a resource. Participants evaluated grouping conditionally: it could support equity through appropriate support and challenge but pose risks through inaccurate placement, fixed labels or constrained opportunities. Accounts also revealed tensions between professional judgment and parent influence and variation in placement review.

Originality/value – This study shows that similar needs-based conceptions of equity and overlapping evidence sources can coexist with different interpretations of need, readiness and resources and different views of grouping, placement authority and review. It situates school-level sensemaking about mathematical opportunities within SDG4's broader equity commitment.

Keywords Ability grouping, Equity, Mathematics education, Mental models, SDG 4, Sensemaking

Paper type Research paper

Introduction

Sustainable Development Goal 4 (SDG 4) calls for inclusive and equitable quality education and lifelong learning opportunities for all (United Nations, 2015; UNESCO, 2016). Given SDG 4's universal scope, efforts to achieve it extend to education provided in both public and private settings (Abidjan Principles, 2019; UNESCO, 2021). Within these settings, broad educational commitments acquire practical meaning through educators' professional understandings and the organizational contexts and established practices of their schools (Ball *et al.*, 2012; Coburn, 2001; So *et al.*, 2024; Spillane *et al.*, 2002). Equity is especially open to interpretation because, although widely valued, it does not have a single, consistently applied meaning in educational practice (Field *et al.*, 2007; Levinson *et al.*, 2022). Studies of

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preservice teachers and practicing educators have found variation in how equity is understood (Kwok *et al.*, 2025; Rosen *et al.*, 2026), raising the possibility that the same educational practice may be evaluated differently depending on the conception of equity applied.

Mathematics education is an important context for examining equity because mathematics can shape students' beliefs about themselves and their identities as learners (Boaler, 2015; Gutiérrez, 2012; National Council of Teachers of Mathematics, 2014). Research on mathematics equity emphasizes access, achievement and identity (Gutiérrez, 2012). NCTM guidance emphasizes high expectations, strong support, consistent opportunities to learn and access to high-quality mathematics curriculum and instruction (National Council of Teachers of Mathematics, 2014). Mathematics coursework can also influence students' access to future science, technology, engineering and mathematics (STEM) pathways (Douglas and Attewell, 2017; Redmond-Sanogo *et al.*, 2016). Because STEM fields contribute to innovation and sustainable development (UNESCO, 2026b), equitable mathematics opportunities are relevant to SDG 4 and broader sustainable development. Ability grouping is one school practice that may shape access to these opportunities.

Ability grouping is widely used in mathematics education across national contexts (Boliver and Capsada-Munsech, 2021; Gupta *et al.*, 2023) and occurs in both public and private schools (Organisation for Economic Co-operation and Development, 2023). Research has concentrated on achievement effects (Steenbergen-Hu *et al.*, 2016), relationships between placement and academic identity (Legette and Kurtz-Costes, 2021), access to rigorous mathematics (Boaler, 2015) and the distribution of students across groups (Archer *et al.*, 2018; Hartas, 2018; von Hippel and Cañedo, 2022). These lines of research address concerns relevant to SDG 4, although they generally do not frame their findings explicitly in relation to SDG 4. Largent (2025) made this relationship explicit by organizing existing evidence around inclusion, equity and quality and assessing whether ability grouping supported or hindered progress toward SDG 4. The review also identified the importance of examining how schools define these concepts. However, empirical research explicitly connecting educators' school-level interpretations of equity and ability grouping to SDG 4 remains limited.

The present study addresses this underexamined intersection by focusing specifically on equity and examining how educators in one private prekindergarten through Grade 8 (PK–8) school conceptualized mathematics equity and reasoned about the equity of ability grouping. SDG 4 provides the broader context for situating this school-level reasoning within its commitment to educational equity. The following research question guided the study: How do educators in one private PK–8 school conceptualize equity in mathematics education and reason about the equity of ability grouping?

Background and relevant literature

Sustainable Development Goal 4 and school-level practice

As the education goal within the United Nations 2030 Agenda, SDG 4 expanded earlier commitments in scope and applies universally across the life course (UNESCO, 2016). Because educational opportunities are organized within schools as well as national systems, schools are an important level for examining how broad equity commitments relate to educational decision-making. Boeren (2019) argues that SDG 4 can be examined at micro, meso and macro levels. The micro level concerns individuals and families, including learners' backgrounds, attitudes, confidence and motivation. The meso level comprises schools and other educational institutions, including how they organize learning

environments and access to educational opportunities. The macro level includes national policies, governmental regulation and system-level structures. Boeren observes that SDG 4 research and reporting frequently provide micro-level information about learners and macro-level indicators about countries and education systems but less evidence about institutional processes at the meso level.

Defining equity in mathematics education

Equity is widely valued in education but does not have a single agreed-upon meaning (Levinson *et al.*, 2022). It is often distinguished from equality by associating equity with fairness and justice and equality with sameness in treatment, resources or opportunities (Field *et al.*, 2007; Levinson *et al.*, 2022). Levinson *et al.* (2022) identify several competing conceptions of educational equity, including equal distributions of outcomes across groups, equal outcomes for individual students, equal allocation of resources, equal educational experiences and equal growth. They further explain that these conceptions may be shaped by concerns about benefiting less advantaged students, ensuring educational adequacy and prioritizing short-term benefits or longer-term structural change. Their analysis demonstrates the importance of specifying which conception of equity is being applied when evaluating an educational practice.

The United Nations Educational, Scientific and Cultural Organization (UNESCO), which coordinates SDG 4–Education 2030, describes equity in terms of fairness and the support, resources and opportunities learners need given their circumstances and barriers (UNESCO, 2016, 2026a). The Organisation for Economic Co-operation and Development (OECD), which contributes monitoring data, connects equity to equal learning opportunities and whether outcomes reflect circumstances beyond students' control (Organisation for Economic Co-operation and Development, 2018, 2025). These definitions do not resolve what equity requires in particular settings.

Recent empirical studies similarly show that educators do not necessarily attach a shared practical meaning to equity. In a study of preservice teachers, Kwok *et al.* (2025) identified varied conceptions and tensions between technical, resource-oriented approaches and more humanizing approaches. Among practicing educators in Swedish school-age extended education settings, Rosen *et al.* (2026) found that equity was difficult for educators to define within a shared conceptual frame and that their understandings were shaped by both everyday practice and structural conditions. Although neither study examined mathematics ability grouping, both demonstrate the value of investigating how educators interpret equity in relation to particular institutional decisions rather than assuming that shared equity language carries a shared practical meaning.

Although this literature illustrates both established conceptions of equity and variation in how educators interpret them, it does not address all mathematics-specific questions involving access, expectations, support, challenge, identity and future pathways. NCTM's Equity Principle states that excellence in mathematics education requires "high expectations and strong support for all students" (National Council of Teachers of Mathematics, 2000, p. 12). Within this framing, equity does not mean giving every student identical instruction or resources; it means providing the accommodations, resources and support needed to access and succeed in meaningful mathematics (National Council of Teachers of Mathematics, 2000, 2014). It therefore combines high expectations for all students with support responsive to differing needs and attention to the quality of their mathematical learning opportunities. These formulations make resources central to mathematics equity but do not fully specify what should count as a resource when schools organize different mathematical opportunities.

Equity in mathematics education may also concern how students understand themselves and are positioned as mathematics learners (Gutiérrez, 2012).

Ability grouping and equity

Ability grouping provides one context in which questions about support, challenge, resources and opportunity become concrete. It places students in instructional groups, classes or pathways based on judgments about achievement, readiness, pace or instructional need (Boaler, 2015; Steenbergen-Hu *et al.*, 2016). It may involve flexible classroom groups, separate instructional levels or course pathways used to adjust pacing, support and challenge.

Evidence concerning academic achievement is mixed. Some forms of grouping have produced benefits when teachers adjusted instruction to students' current achievement, while more enduring separation into different classes has shown limited overall benefit and may widen differences between higher- and lower-achieving students (Duflo *et al.*, 2011; Gamoran, 2009; Steenbergen-Hu *et al.*, 2016). Within its broader SDG 4 analysis, Largent's (2025) review similarly found a near balance between positive and negative achievement evidence. A recent synthesis identified regular assessment, movement between groups and adaptation of instruction as core components of grouping designed to align teaching with students' current learning levels (Kaffenberger *et al.*, 2026). Evidence concerning the achievement effects of ability grouping therefore remains mixed.

Equity-focused research, however, raises more consistent concerns. Placement has been associated with socioeconomic background, race, gender and educators' perceptions, as well as with prior achievement (Archer *et al.*, 2018; Hartas, 2018; von Hippel and Cañedo, 2022). These findings do not establish that every instance of grouping is inequitable, but they indicate that placement may reflect social background and professional judgments in addition to assessment evidence. Evaluating equity therefore requires attention to placement criteria, labels and access to later opportunities, not only to average achievement effects. National Council of Teachers of Mathematics (2023) similarly cautions that ability labels can shape expectations, opportunities and students' mathematical identities and recommends keeping support groups flexible and focused on students' understanding of specific mathematical topics rather than general assessments of ability.

Placement also involves questions about who can influence decisions. Families differ in their capacity to advocate for and negotiate educational opportunities (Lareau, 2011). Research on school choice and international education has also examined whether market conditions position parents as customers and alter the balance of authority between families and schools (Breidenstein *et al.*, 2020; McIntosh and Hayden, 2022). Evaluating placement processes therefore requires attention both to the evidence used and to how influence over decisions is distributed.

Conceptual and analytical framework

The framework for this study distinguishes four functions: sensemaking and mental models serve as complementary analytical lenses; NCTM's conception of mathematics equity provides the conceptual foundation; Boeren's (2019) meso-level framing identifies the school as the level of analysis; and SDG 4 supplies the broader educational context.

Drawing on NCTM's Equity Principle and related guidance, this study treats mathematics equity as combining high expectations for all students with the support, accommodations, resources and access needed for meaningful mathematics learning (National Council of Teachers of Mathematics, 2000, 2014). It therefore does not define equity as providing every student with identical instruction or resources. Mathematics-equity scholarship and guidance on grouping and placement further direct attention to labels, identity, placement processes,

access to rigorous learning and future pathways (Archer *et al.*, 2018; Boaler, 2015; Gutiérrez, 2012; Legette and Kurtz-Costes, 2021; National Council of Teachers of Mathematics, 2023). Accordingly, the analysis examines what participants consider appropriate support and challenge; how they interpret evidence of readiness; how they describe the roles of professional judgment and parent influence in placement decisions and the processes for monitoring and reviewing placements; and how they believe placements can shape expectations and access to mathematical opportunities. The analysis does not treat ability grouping as inherently equitable or inequitable; it examines the benefits and risks participants associated with it.

Sensemaking concerns how people interpret ambiguous circumstances and connect their interpretations to possible action (Weick, 1995). It guides the analysis of how participants interpreted equity in relation to support, challenge, grouping and placement. The mental-model lens complements sensemaking by focusing on assumptions reflected in participants' reasoning (Senge, 2006). In an educational context, Bertrand and Marsh (2015) examined the mental models teachers used to interpret student data and explain student outcomes. In this study, the mental-model lens guides the analysis of assumptions about mathematical ability and development; student need and readiness; resource definition and distribution; and decision-making authority. Because mental models are internal, incomplete and context-dependent representations that cannot be directly inspected (Jones *et al.*, 2011), the analysis treats participants' statements as expressed assumptions rather than complete or stable internal models and does not infer that those assumptions caused particular decisions.

Boeren's (2019) meso-level framing situates the analysis of educators' reasoning about the equity of grouping and placement within the school context. SDG 4 provides the broader rationale for examining how school-level decision-making may shape access to mathematical support, academic challenge, course pathways and future opportunities. It is not used as an analytical lens, a policy participants were expected to invoke or a standard against which the school was evaluated.

Methods

Research design

An interpretive qualitative single-case study examined educators' conceptions of mathematics equity and their reasoning about ability grouping within one private PK–8 school. Qualitative case study supports analysis of a bounded case (Merriam and Tisdell, 2016) within its real-world context (Yin, 2018). The school constituted the bounded case and provided a shared organizational context with established grouping practices. Consistent with the interpretive orientation of qualitative research, the study focused on the meanings participants expressed in interviews (Creswell and Poth, 2018). It did not observe or evaluate how grouping was implemented or its effects on students.

Case context

The study was conducted in a private PK–8 school enrolling approximately 600 students. Interview participants described the school community as including students from diverse backgrounds and cultures. The school maintained a formal equity document developed in 2016. It defined equity primarily in terms of fair treatment, equal opportunity, and access to knowledge and resources, but did not provide mathematics-specific guidance concerning grouping, placement or access to advanced opportunities.

For more than a decade, the school had used formal mathematics ability grouping in Grades 3–8, assigning students to different instructional levels or courses. According to

participants' accounts, placement decisions drew on pre-assessments, standardized mathematics assessment data, input from previous teachers and parent concerns or requests. In Grades 3–5, students could receive remedial, grade-level or above-grade-level instruction. In Grades 6–8, the structure included remedial, grade-level and accelerated mathematics pathways. As participants described it, grouping organized mathematical content, pacing, instructional support and access to later course opportunities.

Participants

Purposive sampling was used to select participants according to study-specific criteria (Creswell and Poth, 2018; Merriam and Tisdell, 2016). In this study, those criteria concerned educators' roles and experience in mathematics instruction, leadership and placement decisions. Because formal grouping began in Grade 3, recruitment emphasized educators with experience in mathematics instruction or placement in Grades 3–8. For reporting purposes, participants were classified by the broad role most relevant to the study. Because these categories were small and uneven, comparisons across role categories were descriptive. Table 1 summarizes the participant role categories.

Permission to conduct the study was obtained from the school. Participation was voluntary, and participants provided informed consent, including consent to audio-recording. Participants were informed that their names would not be reported. Pseudonyms were assigned solely for reporting purposes and do not indicate participants' gender or other identity characteristics. Roles, overlapping responsibilities and other identifying details were limited or generalized to reduce identification risk while retaining context relevant to mathematics practices. The researcher had previously worked with members of the school's mathematics team but did not hold supervisory authority over any participant during the study. Reflexive analytic memos were used to monitor the influence of the researcher's prior familiarity with the school's mathematics context and to keep coding and interpretation grounded in participants' accounts.

Data sources and data collection

The primary data comprised 11 semi-structured, in-person interviews, one with each educator, with a few conducted in late 2023 and the remainder in 2024. Each interview lasted approximately one hour and addressed equity, inclusion and quality in mathematics education. The analysis reported here focused on interview segments concerning equity and ability grouping. Statements about inclusion or quality were included only when participants explicitly connected them to need, readiness, grouping, placement, resources or access; inclusion and quality were not analyzed as separate constructs. All participants

Table 1. Participant role categories ($n = 11$)

Broad role category	No. of participants
Grades 3–5 educator	2
Grades 6–8 mathematics educator	6
Instructional leader	1
School leader	2
Total	11

Note(s): Roles are reported in aggregate to provide context while reducing identification risk
Source(s): Author's own work

were first asked to define equity without being given a formal definition. Subsequent questions addressed variation in mathematical ability, remediation and additional challenge, ability grouping, readiness, resources and placement. The precise sequence of follow-up questions varied as participants elaborated on their responses. There was no single standardized question asking participants to list characteristics required for higher placement; the analysis therefore synthesized relevant statements across these question domains. Interviews were audio-recorded and transcribed for analysis. Two supplementary sources complemented the interviews. The school's equity document was reviewed as contextual material to identify its formal description of equity (Bowen, 2009), not as evidence that participants knew or applied it. Immediately after Blake's recorded interview, the researcher documented a comment in which Blake reconsidered resource distribution. Blake later confirmed the field note's accuracy; it was treated as supplementary rather than *verbatim* evidence.

Data analysis and trustworthiness

Guided by Saldaña's (2016) discussion of qualitative coding and analytic memo writing, the analysis followed four study-specific stages. First, transcripts were read multiple times to identify statements concerning equity and ability grouping. Because the sequence of follow-up questions varied, relevant statements were traced across interview question domains rather than treated as responses to uniform items. Analytic memos recorded emerging questions, coding decisions and reflexive considerations of the researcher's assumptions and familiarity with mathematics education. Second, first-cycle coding combined *in vivo* and provisional coding (Saldaña, 2016). In vivo codes preserved participants' language, including "meeting students where they are," "parent choice" and "mastering or memorizing." Provisional codes were informed by NCTM's emphasis on educational opportunities, support and resources (National Council of Teachers of Mathematics, 2000, 2014), Organisation for Economic Co-operation and Development (2018) attention to opportunities and outcomes and Levinson *et al.*'s (2022) conceptions involving resources, experiences, growth and outcomes. The provisional codes served as flexible starting points rather than fixed categories.

Third, related codes were clustered into broader categories concerning definitions of equity; assumptions about ability, need and readiness; reasoning about grouping and resources; and placement authority and review. Categories were compared across participants and broad role categories. Because the role categories were small and uneven, these comparisons were descriptive. Fourth, the categories were interpreted through the conceptual and analytical framework to develop the four themes reported in the Findings. Sensemaking informed the analysis of participants' interpretations, while the mental-model lens informed the analysis of their expressed assumptions. Because participants could express multiple assumptions, they were not assigned to mutually exclusive categories.

The school's equity document was analyzed separately as contextual evidence of the school's formal description of equity. The participant-confirmed post-interview field note was considered alongside Blake's interview statements within the resource category but was treated as supplementary evidence rather than a *verbatim* record. Trustworthiness was supported through reflexive analytic memos and coding records that documented analytic decisions (Lincoln and Guba, 1985; Saldaña, 2016) and through participant confirmation of the post-interview field note's accuracy (Lincoln and Guba, 1985). Claims were limited to participants' expressed reasoning and were not treated as evidence of observed practice, placement accuracy, stable internal mental models or the effects of grouping on students.

Use of generative AI

During manuscript revision from June through August 2026, the author used OpenAI's ChatGPT (GPT-5) to refine language, organization and formatting. The author retained responsibility for the content, analysis, interpretation, citations and final wording.

Findings

Four interrelated themes are presented below. Although most participants described equity as meeting individual students' needs, their accounts differed in their assumptions about mathematical ability. Participants drew on overlapping evidence sources but emphasized different indicators within them when reasoning about need and readiness. Comparisons across broad role categories did not reveal consistent differences in participants' reasoning overall. The findings concern participants' expressed reasoning rather than observed practice or student outcomes.

Predominant emphasis on individual need

Most participants associated mathematics equity with responding to individual needs. Others initially emphasized equal opportunity or considered whether equity meant providing every student with the same instruction and resources. Across participants' accounts, responsiveness included both additional support for students experiencing mathematical difficulty and greater mathematical challenge – such as more advanced content or faster pacing – for students viewed as ready for those opportunities. Alex stated that "equity is that students get what they need," while Leslie described equity as "giving you what you need to reach where you need to reach." Participants connected this principle with scaffolding, differentiated support and appropriate mathematical challenge. Quinn likewise described equity as individualized and responsive to students' needs, explaining that educators should "meet the child where they are." Quinn connected this responsiveness to challenge: "If every child is at the same level of productive struggle, then that would be equitable."

Not every participant initially defined equity in terms of individual need. Morgan initially asked the interviewer to define equity. Consistent with the study's aim of eliciting participants' own understandings, the interviewer did not provide a definition. Morgan subsequently described equity as "equal opportunity to be successful in mathematics and to learn conceptually." Taylor initially referred to the "same opportunities" and "same resources" and later also emphasized giving students what they needed. Pat acknowledged, "I hadn't really thought about it before you asked," and questioned whether equity meant that everyone received the same education or that students' differing needs were met. Rather than offering a general definition, Sam discussed testing, differentiated instruction and eligibility for higher mathematics classes.

The emphasis on individual need crossed role categories: all three participants in leadership roles and most classroom educators emphasized responsiveness to individual need. Participants' accounts also overlapped with the school document's language of fairness, opportunity and access but extended that language to mathematics-specific questions of support, challenge, readiness and grouping. Because participants were not asked whether they were familiar with or had applied the document, these similarities do not establish that it influenced their reasoning. The prevalence of needs-based language therefore showed that most participants believed students should receive what they needed, but it did not by itself establish shared criteria for deciding which indicators demonstrated need or readiness or what educational response those indicators required. Table 2 summarizes the primary emphases in participants' initial responses to the equity question.

Table 2. Primary emphases in participants' initial equity responses

Pseudonym	Primary emphasis
Alex	Individual need
Blake	Individual need
Casey	Individual need
Dakota	No favoritism and responsiveness to individual need
Leslie	Individual need
Jamie	Individual need
Morgan	Equal opportunity
Quinn	Individual need
Pat	Uncertain: same education for all or individual need
Sam	No general definition provided
Taylor	Equal opportunities and resources; later also emphasized individual need

Note(s): Categories summarize the primary emphasis in each participant's initial response. They are not necessarily mutually exclusive and do not capture every idea participants expressed later in their interviews
Source(s): Author's own work

Making sense of equity through reasoning about student need and readiness

Ability grouping was the established structure through which mathematics instruction was organized at the school. Within this context, participants made sense of equity partly by considering what support or challenge students needed and whether they were ready for more advanced instruction. Terms such as additional challenge, acceleration, advanced work and higher-level placement are interpreted here as context-specific references to more advanced mathematics instruction. Although all participants recognized needs for both support and challenge, the interview protocol explicitly asked about them. The more important variation concerned how participants explained differences among students and reasoned about the need for support or higher placement.

Participants explained mathematical differences through overlapping assumptions about innate ability, effort, opportunity and instruction. Alex referred to students who appeared to arrive already possessing mathematical knowledge: "they're born; they know it," while Jamie described some students as "naturally more gifted." Sam explicitly rejected innate ability, stating, "I think it takes practice." Other participants combined an innate component with the view that mathematical development remained responsive to effort, practice, mindset or experience. Dakota described innate ability as "where you start" but added that subsequent growth could vary "depending on how hard you work." Participants also identified contextual influences, including family resources, tutoring, encouragement, previous exposure to mathematics and curricular gaps. Jamie and Quinn pointed to differences in instruction or teacher expertise, while Blake explained that access to support could "build their competence" and "build their skill level."

Across their accounts, participants emphasized different characteristics as indicators of readiness for a higher mathematics group. Some emphasized material already known, rapid comprehension or rapid completion. Alex emphasized students who "already know the material" and the opportunity "to go at a faster pace." Blake similarly identified students who were "grasping things very, very quickly, and finishing very quickly" as requiring higher-level thinking. Others placed greater emphasis on the nature or depth of students' understanding. Leslie questioned whether performance in advanced courses reflected "mastering or memorizing" and described mastery as the ability to make connections among mathematical ideas. Pat maintained that students needed a secure foundation before moving

to more advanced mathematical work, although Pat did not specify whether this foundation was conceptual, procedural or both.

Other participants emphasized performance, work habits or students' responses to difficulty. Sam considered homework completion, correct answers, demonstrated procedures and initial test performance, explaining that students requiring repeated test retakes should not be "eligible to go into these higher-level classes." Morgan considered prior learning, classroom engagement, comfort with the current concept and whether a student continued to struggle after additional support. Quinn emphasized students' "ability to cope when the struggle gets real." Several participants did not identify a specific student characteristic and instead referred more generally to teachers' knowledge of individual students and professional judgment about whether additional challenge was appropriate.

Participants mentioned many of the same types of evidence that could inform placement decisions. These included assessments, exit tickets, grades and homework; teacher observation, knowledge of individual students and input from previous teachers; and classroom evidence such as written work, discussions and mathematical explanations. Pat stated that students should demonstrate a secure foundation "in a variety of different ways" before moving to more advanced mathematical work. Taylor similarly emphasized that teachers should observe students' work, listen to classroom discussions and ask students to explain their reasoning. Assessments and professional judgment were common, but participants differed in what they believed this evidence showed about students and what other information they considered. Jamie and Quinn treated productive struggle as an instructional condition rather than evidence of readiness. Jamie referred to the "sweet spot of productive struggle," while Quinn reasoned that equity would exist if students experienced an appropriately comparable level of productive struggle. In their accounts, productive struggle described what equitable instruction should make possible rather than a student characteristic that independently demonstrated readiness for higher placement.

Participants therefore shared the language of responding to individual needs and drew on overlapping evidence sources, but they emphasized different indicators and interpretations when reasoning about need and readiness for higher placement. Table 3 summarizes participants' assumptions about mathematical ability and the considerations they associated with student need and higher mathematics placement.

Ability grouping as both an equity mechanism and an equity risk

Participants who discussed grouping generally evaluated its equity conditionally rather than characterizing grouping as inherently equitable or inequitable. Across their accounts, grouping could potentially support equity when it provided appropriate pacing, support, challenge and opportunities for growth, but could undermine equity when it created fixed labels, inaccurate placements or constrained future pathways. Alex, Taylor and Dakota described grouping as a way to match instruction, support or challenge to students' needs. Jamie similarly described differentiation and acceleration as ways to respond to differing needs. Dakota valued instruction among students working at similar levels because it allowed teachers to "focus on students who are at approximately the same place and help them to succeed and grow." Dakota also acknowledged that grouping could reduce interaction among students with different mathematical experiences.

Casey, Blake and Sam raised related concerns that placement labels and classroom expectations could reinforce fixed beliefs. Casey could "see both sides": grouping could help teachers respond to students' needs but could also lead students to believe, "This is where I'm at, and that's it." Blake similarly worried that placement labels could produce a fixed mindset. Sam described how placement and classroom expectations could reinforce

Table 3. Categorical emphases in reasoning about need and higher mathematics placement

Pseudonym	Mathematical ability and development	Need and placement considerations
Alex	Innate ability and school experience	Existing knowledge and faster pace
Blake	Innate ability, learning and family support	Rapid comprehension, completion and performance
Casey	Innate and contextual influences	Teacher-judged suitability for challenge
Dakota	Innate ability and effort	Performance and teacher judgment
Leslie	Effort, willingness and family influence	Conceptual understanding
Jamie	Innate and contextual influences	Appropriate productive struggle; readiness indicator not specified
Morgan	Innate ability and practice	Prior learning, engagement, comfort and response to support
Quinn	Cognitive, emotional and instructional influences	Topic-specific understanding and persistence through struggle
Pat	Instructional and contextual influences	Secure mathematical foundation
Sam	Effort, practice and family influence	Basic skills, work habits, procedures and performance
Taylor	Innate ability, mindset and experience	Conceptual understanding and application

Note(s): Entries synthesize participants' statements across questions about equity, mathematical ability, remediation, additional challenge, grouping and placement. They represent overlapping categorical emphases rather than fixed participant types or responses to a single standardized readiness question.
"Readiness indicator not specified" indicates that the participant discussed appropriate challenge without identifying a particular student characteristic demonstrating readiness for higher placement
Source(s): Author's own work

students' negative beliefs about themselves, including telling themselves, "I've never done well in math," which Sam believed could reduce engagement. Taylor noted that middle-school placement could influence students' later mathematics pathways. Leslie supported grouping but questioned whether some students entered advanced courses without adequate conceptual foundations.

Resource allocation introduced another tension. Alex, Dakota, Blake and Jamie emphasized the additional teacher time directed toward students requiring support, although Alex and Jamie believed that students requiring greater challenge sometimes received insufficient attention. Alex explained, "We put a lot of focus on kids who need extra support," but students who "already know it" also needed "more attention." Blake initially concluded that resources were concentrated among students receiving additional support because teachers helped them outside class. A field note recorded after the interview and later confirmed by Blake documented Blake's reconsideration after noting that advanced mathematics classes often had substantially lower student–teacher ratios.

Pat did not consider resources balanced and believed that teachers struggled to address multiple instructional levels within classrooms. In contrast, Casey, Morgan, Quinn and Taylor described mathematics as comparatively well-resourced through staffing, technology, common materials and teacher availability. These evaluations did not follow a consistent pattern across broad role categories and reflected different understandings of what counted as a resource.

Placement equity: Professional judgment, parent influence and placement review

Participants who discussed decision-making authority generally assigned primary responsibility for placement to mathematics educators, instructional leaders and school leaders because of their access to assessment evidence, classroom knowledge and familiarity with mathematics pathways. Some accounts nevertheless indicated that students and families could also influence placement decisions. Among those who discussed parent involvement, participants from different role categories expressed concerns not about family participation itself but about perceptions that advocacy sometimes outweighed educators' judgments of readiness or that some families were better positioned to obtain preferred higher mathematics placements for their children. Pat valued parent input but reported that placement had sometimes become "parent choice." Blake reported that parents and students sometimes advocated for particular placements because of future high-school goals. According to Blake, this advocacy was "not always in the child's best interest"; Blake had seen instances in which "it can work" and others in which "it actually hurts the child." Leslie initially described placement decisions as collaborative but later characterized them as sometimes "more parent based than teacher based," questioning whether students advanced because of readiness or because of the status associated with advanced pathways.

The private-school context entered Casey's and Taylor's reasoning about family influence. Casey described a tension between professional judgment and responsiveness to families, explaining, "We're a school, but we're also a business," with a "role of customer service" and "a level of politics involved." Taylor similarly reported that parents could sometimes have "a louder voice than we as professionals" and explicitly connected this influence to the private-school context. These accounts show how two participants connected professional authority, family influence and the school's organizational context. Because parents and students were not interviewed, these accounts represent educators' perceptions.

Participants also differed in their assessments of placement processes. Dakota described weekly subject-area meetings in which educators discussed whether students should remain

in or move among groups. Morgan reported that placements and their possible long-term consequences were reviewed before decisions were made, while Taylor described mathematics educators informally monitoring students' progress and discussing concerns. Quinn referred to ongoing conversations and efforts to improve consistency but did not describe a specific systematic review of grouping outcomes. Alex believed that the school was attempting to meet students' needs but stated, "I think we fall short," and called for a clearer understanding of the Grades 3–8 mathematics pathway. Blake reported no systematic examination of grouping outcomes: "We've done nothing like that. I wish we had." These accounts indicated collaborative discussion, review before placement and informal monitoring but did not reveal a clearly described systematic school-wide process for examining outcomes across placements. The study did not independently verify how consistently these processes occurred. Participants therefore linked placement equity to the evidence and authority involved in initial decisions and to how placements were monitored, reviewed and revised over time.

Discussion

This study examined how educators in one private PK–8 school understood mathematics equity and reasoned about ability grouping. The central finding was that most participants understood equity as meeting individual students' needs, a view that broadly aligns with NCTM's emphasis on providing appropriate support, resources and accommodations so that students can engage in meaningful mathematics (National Council of Teachers of Mathematics, 2000, 2014). When reasoning about need and readiness, participants drew on overlapping evidence sources but differed in which indicators they emphasized and how they interpreted those indicators in relation to students' need for support or challenge and readiness for higher placement.

Viewed through the lens of sensemaking (Weick, 1995), participants gave practical meaning to the ambiguous concept of equity by considering how support and challenge should be provided, readiness interpreted, resources understood and placement decisions made. The mental-model lens complements this analysis by directing attention to the assumptions reflected in those interpretations (Bertrand and Marsh, 2015; Senge, 2006). Participants' accounts reflected different assumptions about whether mathematical ability was largely innate or developed through effort, opportunity and instruction; whether readiness was demonstrated through pace and performance or through conceptual understanding and secure foundations; what counted as an educational resource; and how much weight professional and family judgments should carry. These expressed assumptions sometimes overlapped and are not treated as complete or fixed individual mental models (Jones *et al.*, 2011). These assumptions help explain how overlapping evidence sources could be interpreted through different criteria of need and readiness. These differences could affect judgments about the support and challenge students should receive, their readiness for advanced coursework and their placement in or movement among groups. For example, a hypothetical student who completed familiar procedures quickly and accurately but had not demonstrated conceptual understanding might be considered ready for higher placement under a criterion emphasizing speed and procedural accuracy, whereas the same evidence might be considered insufficient under a criterion emphasizing conceptual understanding. Because participants did not evaluate a common student case, however, the study cannot determine whether their different emphases would actually have produced different placement decisions.

One participant's account illustrates how different assumptions about ability and readiness could coexist within the same participant's reasoning. The participant rejected the

idea of innate ability and stated that mathematics "takes practice," yet viewed the need to retake tests as evidence that a student should not be "eligible to go into these higher-level classes." This reasoning combined a view of ability as changeable with substantial weight on first-attempt performance when considering readiness for advanced placement.

Interpretive differences were also evident in how participants evaluated ability grouping. The study was not designed to determine whether schools should adopt or retain grouping; accordingly, the findings represent neither an endorsement nor a rejection of the practice. Participants identified possible benefits when grouping provided appropriate support and challenge, but they also identified risks involving inaccurate placement, fixed labels, negative beliefs about mathematical ability and limited later opportunities. These concerns are consistent with National Council of Teachers of Mathematics (2023) caution that ability labels can shape expectations, opportunities and students' mathematical identities, as well as research connecting grouping with students' experiences of status and labeling (Archer *et al.*, 2018), access to mathematical opportunities and beliefs about ability (Boaler, 2015), and changes in mathematical self-concept associated with track placement and reflected classroom appraisals (Legette and Kurtz-Costes, 2021). Grouping should therefore not be assumed to be equitable simply because it is intended to meet different needs.

Interpretation also shaped evaluations of resource equity: participants differed both in how they perceived resources to be distributed and in what they counted as resources, including teacher time, class size, staffing, technology, advanced coursework and enrichment. Blake initially viewed resources as concentrated among students receiving additional support because teachers provided them with extra time but questioned that conclusion after noting that advanced mathematics classes had smaller student–teacher ratios. This reconsideration illustrates that applying conceptions of equity emphasizing resource allocation (Levinson *et al.*, 2022) and access to support and opportunities (National Council of Teachers of Mathematics, 2000, 2014) requires attention to what is recognized as a resource.

Beyond the criteria and resources associated with grouping, placement decisions raised a further question: whose judgment carried the greatest authority. Several participants believed that some families' requests could carry greater weight than educators' judgments. Previous research shows that families' interactions with educational institutions vary by social class (Lareau, 2011), and studies of school choice and international schools have examined consumer-oriented features of parent–school relationships (Breidenstein *et al.*, 2020; McIntosh and Hayden, 2022). Because parents and students were not interviewed, the study could not compare their perspectives with educators' accounts or determine whether educators' judgments were more accurate. The findings nevertheless raise questions about whether all families have similar opportunities to participate and whether the reasons for placement decisions are clear.

Participants' differing descriptions of placement review suggest that placement equity concerns not only how initial decisions are made but also whether placements are revisited and students can move as their needs change. This emphasis on flexibility is consistent with National Council of Teachers of Mathematics (2023) recommendation that support groups remain flexible and focus on students' understanding of specific mathematical topics rather than general assessments of ability. In a related instructional context, Kaffenberger *et al.* (2026, p. 29) similarly identify simple, regular assessment and dynamic, ongoing regrouping as ways of responding to students' changing learning levels.

These concerns about criteria, authority and review can be situated within the broader commitments articulated by SDG 4 and the school's formal equity document. At the broadest level, SDG 4 articulates a global commitment to inclusive and equitable quality education

(United Nations, 2015; UNESCO, 2016). At the school level, the formal equity document described equity in terms of fairness, opportunity and access. Although its broad scope may be appropriate for a statement intended to apply across multiple areas of school practice, the document did not specify how these principles should guide mathematics grouping or placement. Research on policy enactment and sensemaking suggests that educators interpret and translate broad commitments through their professional and organizational contexts (Ball *et al.*, 2012; Coburn, 2001; So *et al.*, 2024; Spillane *et al.*, 2002), while Boeren's (2019) meso-level framing identifies the school as the level between broader commitments and students' mathematical opportunities. The interviews, however, did not establish whether participants consciously drew on either the school's equity document or SDG 4. Accordingly, this comparison does not demonstrate that the document shaped participants' reasoning, that the school failed to advance SDG 4 or that participants' interpretations resulted in unequal opportunities. The analysis instead identifies school-level criteria, decision-making authority and review processes as important areas for examining how broad equity commitments relate to mathematics grouping and placement. This school-level focus complements Largent's (2025) review, which synthesized equity-focused evidence suggesting that ability grouping could hinder progress toward SDG 4's equity commitment and, drawing on Levinson *et al.* (2022), noted that educational equity lacks a universally accepted definition. The present study adds an empirical account of how needs-based descriptions of equity were connected to reasoning about grouping and placement within one school.

Several practical implications follow. Schools could create structured opportunities for educators to clarify what equity means in mathematics and examine the assumptions reflected in reasoning about ability, need and readiness. They could establish shared criteria for interpreting different forms of evidence and transparent processes for making, reviewing and revising placement decisions. Schools that continue to use ability grouping could examine whether students in every placement have access to appropriate support, challenge and meaningful mathematics, as well as whether labels encourage fixed perceptions or limit later opportunities. They could also review how resources are distributed and how families are invited to participate. Family input should be accessible and transparent rather than dependent on some families' greater ability to advocate, while professional judgments and their supporting criteria should remain open to review. These steps would not guarantee equitable outcomes, but they could make the reasoning and authority behind important mathematics decisions clearer.

Limitations and future research

The case involved 11 educators in one private PK–8 school, with more Grades 6–8 mathematics educators than Grades 3–5 classroom educators. Small and uneven role categories limited the ability to identify patterns associated with professional roles. The study examined educators' expressed reasoning at one point in time and did not include students' or parents' perspectives, classroom observations, placement records, demographic analyses of enrollment, records of movement among groups or student outcome data. Participants described aspects of grouping and placement, but the study could not independently verify how these processes were enacted, assess placement accuracy or determine whether access or outcomes differed among student groups or whether placement processes were equitable in practice. The findings are not intended to represent all schools, but the case may offer useful points of comparison for schools examining their own definitions of equity and their grouping and placement processes.

Each educator participated in one interview, and the protocol did not ask all participants to evaluate the same student cases or placement vignettes. The study therefore cannot determine how participants' reasoning might develop through collective reflection or whether different emphases would produce different recommendations for the same student. Interview prompts may also have shaped later responses because participants were explicitly asked about remediation, additional challenge and ability grouping. Future research could use common student cases and longitudinal placement data to examine whether educators' different interpretations produce different recommendations, movement patterns and outcomes. Including student and parent perspectives would also permit comparison with educators' accounts.

Conclusion

Most participants described mathematics equity as responsiveness to individual need. When reasoning about student need and readiness, they drew on overlapping evidence sources but emphasized different indicators and interpreted what those indicators suggested differently. They also differed in what counted as a resource. Grouping was presented as conditionally equitable, with possible benefits and risks. Participants' accounts also revealed tensions over placement authority and variation in placement review. Viewed through sensemaking and mental models, these patterns can be understood in relation to assumptions evident in participants' reasoning. Boeren's (2019) meso-level framing situates these concerns at the school level. SDG 4 provides the broader context for considering the significance of these findings for equitable access to mathematical opportunities. Although the study does not establish that these variations produced unequal opportunities, it identifies school-level criteria, decision-making authority and review processes as important considerations when examining equity in mathematics grouping and placement.

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