

Exploring the Roles School Administrators Can Play in Helping Elementary Teachers Implement Mathematics Differentiated Instruction More Effectively

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ABSTRACT

Recent data indicate that students' overall achievement in mathematics in the United States continues to deteriorate and that performance deficits worsen over time, highlighting the importance of focusing intervention efforts on early grades. To resolve this problem, many schools now require teachers to incorporate differentiated instruction (DI) into their practice, as research suggests that when appropriately implemented, DI improves learning and performance through instructional modifications that more effectively incorporate students' interests and differences in learning. However, studies also indicate that many teachers feel unprepared to implement DI effectively to support their diverse classrooms. This phenomenographic study explores the perspectives of 17 elementary mathematics teachers on their understanding of DI and barriers to effective implementation, to better inform school administrators about the support teachers need to overcome these challenges. Results indicate that administrators can best support teachers with DI implementation in several ways, including fostering the awareness that DI is not only useful for struggling students; providing more modeling of DI implementation in practice; offering more training for online differentiation; and engendering consensus among staff on what terms/language to use or avoid when referring to different groups of students, to facilitate empowerment and collaboration.

Keywords: differentiated instruction, cultural and linguistic diversity, students with disabilities, inclusive mathematics teaching

The Program for International Student Assessment (PISA) is an international assessment that measures mathematics, science, and reading literacy among 15-year-olds, administered to evaluate the effectiveness of educational systems worldwide. PISA is administered by the 38-member-country Organization for Economic Cooperation and Development (OECD). The most recent data published in 2023 by PISA show that, among 38 countries, the United States ranks 28th and has had its worst performance in mathematics since the assessment's inception in 2000 (Barshay, 2023). Further analysis of the data suggests that as much as 67% of 15-year-olds within the United States, who are primarily in grade 10, are unable to compare distances between two routes or convert money from one currency to another (Barshay, 2023). In addition, studies show that culturally and linguistically diverse (CLD) student populations and students with disabilities (SWD) continue to experience significantly lower levels of mathematics achievement in comparison to their peers and that the deficit between high-achieving and low-achieving students continues to widen (Barshay, 2023; Dorn et al., 2020; Pak & Parsons, 2020; UNESCO, 2017).

In an effort to resolve these academic learning and performance deficits, many school districts across the United States now require teachers to incorporate differentiated instruction (DI) into their practice. As defined by Tomlinson and Imbeau (2023), differentiated instruction involves incorporating students' various cultural/linguistic backgrounds, readiness levels, interests, learning differences, and learning profiles into the teaching process and using this information to modify instruction accordingly. Within such learning environments — populated by increasingly diverse student populations — teachers, support staff, and other professionals collaborate to facilitate optimal learning experiences for all students. The

learning environment is also characterized by students feeling valued for their unique strengths and having access to various ways to demonstrate what they know (Mulroy & Eddinger, 2003; Tomlinson & Imbeau, 2023).

Research increasingly demonstrates that, when appropriately implemented, DI can improve academic learning and performance outcomes through instructional modifications that more effectively incorporate students' needs, interests, and differences in learning (Heacox, 2002; Tomlinson & Imbeau, 2023). However, despite the immense potential DI can offer the inclusive classroom, research shows that while most teachers have some understanding of it, many feel incapable of appropriately implementing DI to accommodate their students' dynamic differences in learning (Lavania & Nor, 2020). These challenges are often associated with insufficient DI knowledge, inadequate knowledge of data-driven teaching and learning methodology, insufficient time to plan and implement DI, large class sizes, insufficient administrative support, and overloaded curricula (Lavania & Nor, 2020). Given that disproportionate learning and performance deficits in mathematics widen as students advance to higher grade levels (Dorn et al., 2020), the support mathematics teachers need in earlier grades to incorporate DI more effectively amongst their increasingly diverse student body becomes even more important. In fact, the literature shows that students' early experiences with mathematics can have a lasting impact on engagement, learning, and achievement in future schooling (Clements & Sarama, 2014). As such, the purpose of this phenomenographic study was to explore elementary teachers' conceptions of DI and the barriers to successful DI implementation, especially for resolving the historical mathematics learning and performance deficits among CLD students and SWD. It is expected that the resulting implications will provide a framework that can be used by school administrators to provide the support necessary for teachers to implement DI more effectively in resisting long-standing learning and performance deficits in mathematics.

REVIEW OF LITERATURE

DI Is Not New

Although DI has gained significant attention in recent decades, the concept is not new. Betts (1946) advocated this approach to teaching through what he termed *differentiated guidance*, requiring teachers to guide students through their individual stages of development, informed by continual assessment of their strengths and weaknesses. Also, according to Sherman (2008), the applications of DI stem from the work of John Dewey, who highlighted the importance of teachers modifying instruction to serve the needs of their students (Dewey, 1916). Though not a new concept, current representations of DI are widely attributed to the work of educator, professor emeritus, and author Dr. Carol Ann Tomlinson. Within these models, differentiation takes place across four domains: content (the knowledge, understanding, and skills that students need to learn), process (the ways in which students come to understand and make sense of what is being taught), product (the ways in which students are allowed to demonstrate what they have learned), and affect/learning environment (the look and feel of the classroom and the ways in which students are allowed to interact with each other) (Tomlinson, 2003; Tomlinson & Imbeau, 2023).

Durgin (2026) emphasizes an important assumption associated with DI theory—that DI is not only for struggling students or SWD but also benefits all learners. Furthermore, Durgin notes that when teachers consider content, instruction, assessment, and the learning environment when planning DI for mathematics, certain features are typically associated with instructional practices. These include *peer collaboration* (e.g., a couple of students are paired together, with one reading a math word problem to the other); *differentiated tasks* (e.g., a group of students is working on a version of a word problem worksheet with simpler sentence structures, or a group of students is meeting with the teacher to participate in an extension math activity); *access to additional support when needed* (e.g., a small group of students is meeting with the teacher to be retaught a math skill or to receive additional time to complete a math project or assignment); and *active autonomy in one's own learning* (e.g., a variety of different colored folders are present on a math center table that students can choose from, each with a different activity based on their various needs or preferences, or students are provided with a variety of options to demonstrate that they have mastered a skill).

The Evidence for DI

While research on measuring DI implementation continues to evolve, it has been challenged by a lack of consensus in the literature on how best to measure DI effectiveness. Van Geel et al. (2019) conducted a systematic review of the literature to understand the various methods by which DI has been measured in research. The review found that in most studies, attention varied across how students were grouped, which instructional materials were used, how lessons were paced, and

the types of questioning teachers employed. These findings suggest a need for more research focused on developing more valid and reliable forms of DI measurement (Parsons et al., 2018).

Notwithstanding the complexity of measuring the effectiveness of DI, it is clear that its implementation improves academic performance. For example, Am et al. (2023) conducted a systematic review and meta-analysis of 49 studies published between 2010 and 2023 that measured academic outcomes in students after DI was implemented, compared with control groups. Among the studies, DI strategies identified included providing differentiated tasks that cater to students' differing interests, teaching students numerous learning strategies tailored to their unique learning styles, and incorporating flipped instruction, where instruction is sometimes provided online in the form of homework so that class time can be used primarily for peer collaboration and working on projects. The extensive scope of the studies assessed included outcomes such as academic performance, critical thinking skills, reading comprehension, decoding skills, and mathematics problem-solving. In addition to mathematics, the reviewed studies examined the effects of DI across a range of subjects, including science and English. The studies originated from the continents of Africa, Asia, and Europe, and from the United States, and spanned kindergarten, elementary, high school, and college academic levels. Am et al. (2023) acknowledge that the effectiveness of DI implementation is highly nuanced and contextual, based on specific country and school environments and norms. Nonetheless, the data generally indicated a significant positive influence of DI on academic engagement and performance compared with control groups of students who were not instructed using DI pedagogy. The authors concluded that these results indicate substantial consistency in effect size across grade level, subject, and sample size, thereby supporting the universality of DI's efficacy.

Teachers Feel Unprepared for Effective DI Implementation

Research on early-grade teachers' conceptions and experiences with DI is burgeoning and beginning to point to some causes of unsuccessful DI implementation. For example, in a study conducted by Strogilos et al. (2017) on elementary co-taught classroom teachers, some of whom were inclusive general education teachers and some of whom were special education teachers, it was found that teachers generally found DI implementation challenging because of the lack of sufficient time and resources, pressure to complete the approved curriculum, and insufficient training. Some teachers also indicated being fearful of accusations of discrimination while attempting to treat SWD "the same" as their peers within inclusive classroom settings. Strogilos et al. (2017) identified several barriers to effective DI implementation, including the belief held by many teachers that DI is suitable only for SWD. Furthermore, many teachers believed that DI was necessary only when students needed more help or had difficulty understanding what the teacher was saying. It was also found that the majority of the teachers considered differentiation only in terms of adjustments to teaching strategies, without indicating awareness of other dimensions of DI, such as assessments or the learning environment.

Other studies have identified similar challenges that general education teachers face in appropriately implementing DI within inclusive classrooms. While the co-teaching instructional model—where classes are taught by both a general education teacher and a special education teacher—has been the most common form of inclusive co-teaching (Cook et al., 2017), many general education teachers in this setting report experiencing inadequate co-teaching support (Pak & Parsons, 2020). Studies consistently report that within the inclusive setting, when DI is appropriately implemented, general education teachers increasingly come to acknowledge that specialized services work well not only for SWD but for all students (Florian, 2014); the academic performance and socio-emotional engagement of SWD are significantly improved (Biklen et al., 2014); and the inclusion of SWD in general education classrooms does not impede the academic progress of their peers. In fact, peers of SWD are more likely to view disability in a positive light (Salend, 2016), and special education teachers experience a greater sense of belonging and purpose when exposed to a broader range of learner differences (Salend, 2016). Despite these potential benefits, however, many general education teachers are unable to reap these benefits, because of the influence of certain barriers such as limiting DI beliefs (De Jager, 2017); insufficient support and training to manage students who experience emotional disturbance (Gilmour, 2018); and the combination of insufficient time, additional paperwork, overwhelming class sizes, and numerous other school responsibilities (Aldossari, 2018; De Jager, 2017; Lunsford, 2017).

Several factors served as motivation for this study. Firstly, while DI scholarship is promising, DI research has paid most of its attention to special education classrooms (Choi et al., 2020). Additionally, despite its relevance to best practices in teaching, how general education teachers think about implementing DI for the inclusive classroom, and the factors influencing their perceived efficacy with its implementation, remain insufficiently explored (Russo et al., 2021).

METHODS

A phenomenographic methodology was employed for this study because the goal was to obtain a more in-depth understanding of the different ways in which general education elementary teachers of mathematics understand the role of DI and the factors that impede its efficacy in implementation. Phenomenography is a qualitative form of research concerned with exploring different understandings or conceptions of a phenomenon and seeks to identify categories of description that depict appearances, experiences, and meanings (Hajar, 2021; Marton & Pang, 2008).

After approval was received from a large Southeastern State University's Institutional Review Board, recruitment emails inviting teachers to participate in the study were sent using public, charter, and private school websites within the state. General education elementary mathematics teachers of varying demographics, including age and gender, with at least three years of experience with the implementation of DI, participated in the study, since teachers generally need at least three years of experience to develop competence and confidence (Murray & Male, 2005), and also since teachers generally require more than three years of experience with DI implementation to feel competent to use it consistently (Van Geel et al., 2022). Data saturation was achieved by the seventeenth interview, meaning that no new insight continued to emerge from the interviews. Through open-ended, structured Zoom interviews, insight into general education elementary mathematics teachers' conceptions of DI and of barriers to their efficacy in its implementation was attained. Table 1 provides additional information about the teachers who were interviewed. Pseudonyms were used to maintain participant confidentiality.

Table 1

Participant Information

	Gender	Grade Level	Years of Experience	School Type	Qualification(s)
T1	Female	5	3	Public	B.Sc. Spec Ed.
T2	Male	4	11	Public	M.Sc. Elem. Ed.
T3	Female	5	6	Public	B.Sc. Biology
T4	Female	4	5	TI Public	B.Sc. Elem. Ed.
T5	Male	2	10	Public	Ed.D. Ed. Ldshp; M.Ed. Spec. Ed
T6	Female	5	13	Public Virtual	Ph.D. Ed. Ldshp; M.Sc. Sec. Ed.
T7	Female	4	20	Public	B.Ed. Elem. Ed.
T8	Female	1	10	TI Public	M.Sc. Elem. Ed.
T9	Female	4	8	Public	B.Sc. Elem. Ed.
T10	Female	2,3	5	Private	BA. Crim. Justice
T11	Female	3	8	TI Public	Ph.D. Ed. Ldshp; M.Sc. Elem. Ed.
T12	Male	2	6	Public	B.Sc. Spec. Ed.
T13	Female	3	17	Public	M.S. Reading; B.Sc. Earth Sci.
T14	Female	1	10	Charter Virtual	M.Sc. Elem. Ed.
T15	Female	4	6	TI Public	M.Sc. Reading
T16	Female	4,5	23	Private	Ph.D. Math Ed; M.Sc. Elem. Ed.
T17	Female	3	24	Public	Ph.D. Elem Ed; M.S. English

Note. TI refers to Title I teachers.

To analyze the data, all interviews were transcribed verbatim using the closed-caption feature provided by the Zoom software platform. Transcriptions were coded after each interview by highlighting code words obtained from the participants' own words (verbatim coding). As the interviews progressed, the patterns identified in the codes informed the development of the themes suggested by the data. The resulting interpretations were then examined to answer the study's research questions:

1. What are general education elementary mathematics teachers' conceptions of DI and conceptions of the barriers that affect their efficacy with its implementation?
2. Based on general education mathematics teachers' conceptions, what forms of support are necessary for them to more effectively implement DI in ways that resist historically disproportionate mathematics learning and performance among CLD students and SWD?

3. Based on general education mathematics teachers' conceptions, what changes within the learning environment are necessary for a culture of equity, inclusivity, collaboration, and fairness to flourish within inclusive general education elementary mathematics classrooms?

RESULTS AND IMPLICATIONS

The results of the study are presented as a guide that school administrators can use to help prepare mathematics teachers at all grade levels to navigate seven identified barriers to instruction that inhibit effective DI implementation. Accompanying this guide is a set of discussion questions for school administrators and professional development practitioners to encourage more meaningful dialogue with teachers and make the implementation of mathematics DI more effective, practical, and sustainable.

Barrier 1: The Misconception that DI is Intended for Struggling Students

Research Insights

The majority of general education teachers interviewed view DI as a temporary intervention strategy aimed primarily at supporting SWD or those performing below grade level. Typically, they associate DI with small-group instruction following poor test performance on specific standards. For example, participant T4 described DI as “small groups for students who did not do well on particular standards in a test.” T7 stated that DI “benefits the ones who struggle the most.” Teachers who had special education training demonstrated a broader and more inclusive understanding of DI. They acknowledged its value in supporting a wide range of students, regardless of ability level. As stated by T12, DI involves “...providing the students in your class with what they need to be successful, no matter how low or high they may be.” Also, T2 stated, “All students benefit from DI. I as the teacher must ensure that I cater to all learning styles and preferences for learning.”

Recommendations for School Administrators

School administrators should instill an understanding, particularly in general education teachers, that DI is not limited to remediation. It should be continuously implemented to meet the diverse learning needs of all students, including high achievers. Additionally, collaborative planning sessions between general education and special education teachers should be promoted to share inclusive DI strategies. Furthermore, mentorship models that allow special education teachers to guide their peers in using strategies that enhance both engagement and achievement for all students should be incorporated into school practice.

Discussion Question

What are some ways in which you could differentiate mathematics content that address the needs of your struggling students as well as your high-achieving students?

Barrier 2: Insufficient IEP/504 Paperwork Preparation

Research Insights

Most general education teachers reported feeling unprepared to handle the paperwork and legal requirements associated with teaching SWD with IEPs or 504 Plans. However, all special education teachers reported feeling adequately prepared for these responsibilities. For example, T1 indicated that majoring in K-12 special education enabled her from the start of her teaching career to meet IEP and 504 expectations. She stated, “I majored in K-12 special education, so I had the tools and felt comfortable with coping with IEP accommodation requirements. I’m just not sure how teachers who did not get this training cope with these things, especially at the beginning of their careers.” On the other hand, T10, for example, noted, “no one taught me about IEPs [or] 504s. No one taught me what the difference between IEPs and 504s are and so on.”

Special education teacher T5 also highlighted a nuanced aspect of working with IEP and 504 students that many new teachers are unaware of—identity and acceptance among peers. T5 stated,

Regarding IEPs, [I have to] handle kids who are conscious about how they look with their peers and not wanting to utilize accommodations provided in their IEPs. Because it is a legal document, you have to help the child understand

this is something that has to be provided, then, in collaboration with the parents at the yearly IEP review meeting, we can reconsider whether certain accommodations are no longer needed.

Recommendations for School Administrators:

It is recommended that school administrators provide targeted professional development focused on the differences between IEP and 504 Plans, their legal implications, and best practices for implementation. Also, it is suggested that experienced teacher mentors be assigned to assist beginning teachers with the documentational and instructional aspects of SWD teaching.

Discussion Question

Do you know what the acronym *IEP* stands for or the significance of the number *504* in reference to 504 plans?

Barrier 3: ELL and ESE Teacher Certifications Alone Do Not Sufficiently Prepare Teachers to Accommodate English Language Learners in Mathematics

Research Insights

The study revealed that teachers are concerned that state-mandated ELL and ESE certifications fail to adequately prepare them to accommodate students whose first language is not English. For example, T15 stated, “I’m considering having that certification removed...there is so much I do not know about ESE students’ needs, and it is stressful.” She emphasized that being fluent in Spanish—rather than having obtained the certification—was what enabled her to support her ELL students effectively. It was also found that there is a general lack of cultural sensitivity in the instructional resources provided for teachers to use with their ELL and ESE students. For instance, T1 recalled a situation that caused tremendous confusion among some of her students because a mathematics textbook cited a word problem in which the character's name was *Cara*, which also means *expensive* in Spanish. T1 felt that a teacher with ELL or ESE certification who was not a native Spanish speaker would likely miss the source of this confusion. According to T1,

There was an issue with a particular problem in our math textbook. The topic involved least to greatest. In the problem, the name of the character was “Cara.” Cara happens in Spanish to mean expensive, but in the problem, Cara had received the least amount. This caused confusion in some of my ELL students. Even though I myself happen to speak Spanish, I overlooked this as a potential issue for my English language learners. I can imagine how much more of a challenge this could be for teachers who are not fluent in Spanish. So, I learned from this moving forward that I need to double-check the assignments provided to my students for issues such as this, and change the names accordingly.

Recommendations for School Administrators

As a best practice, school administrators should leverage multilingual staff to assist with translation, small-group reteaching, and reviewing instructional materials for potential cultural/linguistic misunderstandings. It is also recommended that administrators advocate for in-school ELL/ESE professional development training to supplement state-approved ELL and ESE certifications.

Discussion Question

When you see or hear the terms *ELL* or *ESE*, do you automatically think of Spanish as being the most common native language of your ELL or ESE students? To what extent do you think other native languages have become more typical in today’s diverse classrooms, and what can your school do to support students with these rapidly increasing non-Spanish native languages?

Barrier 4: Insufficient Modeling of DI Implementation Techniques in Teacher Preparation and Professional Learning Programs

Research Insights

Teachers generally reported that although their teacher preparation programs introduced them to the concept of DI, it was not modeled for them in the classroom. For example, T9 noted, “What I learned in college about DI looked totally different from what it looks like in the actual classroom.” T10 added,

I had a bachelor’s degree in criminal justice. So, I had no formal training as a teacher, but as you know, I was still able to obtain my temporary certificate, which is what I now have, which allows me to start teaching. So, I have no prior training in DI as it was self-taught. I have only taught in private institutions. No one sat me down and walked me through how to write lesson plans [or] how to implement DI.

Also, T1 advised that “I am not comfortable with giving small group instruction because I wasn’t given the training on how to do it. I was lectured on how to do it in school, but that was different from real-life implementation. Teacher colleges need to model more.”

Recommendations for School Administrators

School administrators would need to provide ongoing professional development opportunities for teachers in which current research-based DI implementation strategies are both discussed and modeled, empowering teachers to implement DI more effectively in their own classrooms. As an extension of this, the practice of peer observation should be encouraged, so that beginning teachers can see effective DI strategies being implemented by more experienced teachers in that particular school context.

Discussion Question

DI may look different across the various mathematics classrooms in your school. With this in mind, are there still important actions or activities you would expect to occur in all classrooms?

Barrier 5: Unawareness of the Benefits of Heterogeneous Student Grouping Over Homogeneous Student Grouping

Research Insights

Studies show that in many circumstances, homogeneous (same-ability) grouping can undermine mathematics learning and engagement by reinforcing ability labels, leading teachers to persist with low expectations for some students. On the other hand, heterogeneous (mixed-ability) grouping, though more demanding, is generally associated with more equitable learning opportunities and improved academic outcomes across ability levels (Coles & Brown, 2021; Russo et al., 2021).

While some teachers reported a preference for homogeneous grouping—sometimes due to administrative expectations—others reported successfully implementing heterogeneous grouping. Those teachers in the study who incorporated mixed-ability student groups cited stronger peer interactions and more collaborative skill development. For example, T13 noted, “At every table, there are faster students, lower students, and those in the middle so they can learn from each other.” Also, T3 stated, “If they didn’t learn it from me, oftentimes their peers can explain it better.”

While all teachers in the study reported that DI implementation is expected at their schools, they noted that, in most cases, their administrators sought evidence of implementation primarily through the presence of homogeneous student grouping, usually in the form of small-group instruction. For example, T13 stated, “It is difficult to work with an administration who has expectations for DI but is not knowledgeable enough to appreciate that DI involves more than just a group of students sitting at the back table in a group.” Commonly reported challenges teachers face when grouping students include insufficient modeling in teacher preparation programs for forming effective groups, dominant students taking over group tasks, difficulty assigning clear and meaningful roles, and uncertainty about choosing between homogeneous and heterogeneous grouping.

Recommendations for School Administrators

It is recommended that more opportunities be built into daily schedules for collaborative lesson planning and peer observations focused on sharing effective grouping strategies. Additionally, flexible grouping—both homogeneous and heterogeneous, where appropriate—should be incorporated into DI classroom evaluation protocols so that teachers may come to understand that heterogeneous student grouping is an expected component of mathematics DI implementation.

It is also important that administrators understand that while looking for evidence of DI in their teachers' classrooms, be aware that DI extends beyond student grouping and can also involve flexible content delivery, varied questioning techniques, scaffolding, language supports for ELL students, and other adaptations to the learning environment that encourage diversity, inclusion, collaboration, and the celebration of learning differences.

Discussion Question

What can be done in your school to promote a culture that encourages school administrators to continually avail themselves of up-to-date DI research-based best practices, so that their expectations of teachers, as is the case with student grouping, remain data-driven?

Barrier 6: Insufficient Training on How to Differentiate Mathematics for Virtual Teaching

Research Insights

The COVID-19 pandemic provided an unexpected lens into both the challenges and potential of DI in virtual teaching. T4 stated, "Some kids had laptops with no internet . . . It was difficult for them having to learn behind a laptop for eight hours a day, even having to do P.E. online." T13 reported, "There is a difference between simply using technology, and using technology with a purpose. Simply assigning an online video on BrainPOP to students isn't DI. You have to have a meaningful purpose behind it." T6 added,

Due to COVID, the number of students enrolled in our online classes ballooned, and so many more teachers had to be hired to deliver online lessons. It was a challenge trying to teach new teachers not only how to use the various technology but being able to use them to effectively differentiate instruction. . . . things as simple as learning how to write on the board in Zoom.

Several teachers in the study expressed a concern that the pandemic forced them to become more comfortable with digital tools, but many felt unprepared to use them effectively for DI. Insufficient training led many teachers to resort to one-size-fits-all approaches during remote learning.

The teachers who reported navigating virtual instruction effectively, cited specific tools that helped them differentiate instruction, including i-Ready, Success Maker, Reflex Math, IXL Math, Go Math, Teaching Strategies Gold, Kahoot, Google Classroom, Group Jam, BrainPOP, CLEVER, Jam Board, and Class Dojo.

Recommendations for School Administrators

As a best practice, more virtual DI professional development should be facilitated in schools, with both outside specialists and experienced teachers within the school invited to share their knowledge of the software programs they use and how they differentiate these tools remotely to accommodate students' diverse learning styles and interests. Also, regular technology audits should be conducted to ensure that all students and teachers have access to reliable devices, internet access, and support. Encourage an academic environment in which teachers feel more prepared to transition to remote learning if necessary and more capable of using the virtual tools at their disposal to differentiate mathematics effectively.

Discussion Question

The number and nature of virtual software, many of which are free, available to support students' learning in mathematics continue to grow exponentially. What plan could your school put in place to keep teaching staff abreast of these virtual tools and how to use them effectively?

Barrier 7: Unawareness of How Terms Used in the Classroom to Refer to Differences in Students May Affect Engagement, Learning, and Performance in Mathematics

Research Insights

The use of terms/language carries tremendous power to both uplift and disenfranchise different populations (Ladson-Billings, 2013). During the interviews, it was observed that teachers' choices of terms for different groups of students in their classrooms highlighted an important issue that could significantly impede the effectiveness of DI implementation efforts. Terms used by the teachers during the interviews include *special-needs students*, *students with disabilities*, *students with specific learning disabilities*, *neurodiverse students*, *African American students*, *Black students*, *minorities*, *Latino students*, *Latinx students*, *Hispanic students*, *Brown students*, *Native American students*, *Mexican students*, *high students*, *middle students*, *low students*, *slow students*, *weak students*, *average students*, *fast students*, and *global majority students*.

At various points during the interviews, the teachers were observed to be extremely cautious in their choice of terms when referring to particular groups of students, seemingly out of fear of being perceived as politically incorrect. It is therefore crucial that teachers have a good understanding of terms to avoid that could potentially disenfranchise students, such as "My autistic students." Instead, a teacher who uses the phrase "My students with autism" empowers students to appreciate that autism is only one of the many dimensions of their identities (Clarke et al., 2017).

Recommendations for School Administrators

The development of a shared framework that guides the use of language in schools should be facilitated for all staff, including non-teaching employees, when referring to students' various identity groups (e.g., race, ethnicity, ability, neurodiversity, academic performance). This framework should be flexible, data-driven, and culturally responsive. It should be developed collaboratively with teachers, families, students, and community members to ensure that the terms align with the lived realities of the students involved.

Training centered on culturally responsive and identity-affirming language should be incorporated into professional development initiatives while ensuring that teachers have space to ask questions, discuss terminology without fear of judgment, and learn about how identity language evolves over time. For instance, workshops could explore the implications of terms used to describe different groups of students, such as *Latinos*, *students of color*, or *special needs*, and examine how their usage varies across communities and over time, and how societal changes have led to the need to reimagine many of these terms. It is also recommended that regular audits of textbooks and curriculum resources be conducted to ensure that the terminology used is affirming, up to date, and representative of students' identities. For example, during her interview, T11, who has Native American heritage, expressed concern that even today, many textbooks portray Native Americans as historical figures who have gone extinct. Therefore, school administrators should consult with cultural consultants and other experts to ensure that all instructional materials reflect contemporary and accurate representations of all student populations.

Discussion Question

Historically, terms such as *special needs* and *retarded* were seen as legitimate descriptors of certain categories of students. Over time, these terms came to be seen as limiting and demeaning. What factors do you think contribute to these changes over time, and can you think of terms in use today that are ready for a similar change?

Table 2

A Summary of Barriers to DI Implementation and Recommendations for School Administrators

Barriers to Effective DI Implementation	Recommendations for School Administrators
The misconception that DI is intended for struggling students	Share with teachers, evidence-based research that demonstrates that DI improves learning and engagement in all students and not only those who may be struggling.
Insufficient IEP/504 paperwork preparation	Don't assume that teachers know what IEP and 504 documents are and how they should be used, and ensure that this issue is adequately addressed in professional development.
ELL and ESE teacher certifications alone do not sufficiently prepare teachers to accommodate English language learners in mathematics	Recognize that classrooms are diverse and students speak numerous first languages that teachers may not be competent in. Encourage teachers to collaborate more with multi-lingual staff and regularly audit teaching materials to ensure that they foster inclusivity and collaboration instead of disenfranchisement.
Insufficient modeling of DI implementation techniques in teacher preparation and professional learning programs	Incorporate a system of peer-observation so that new teachers within their unique school contexts, will have ample opportunities to observe more experienced teachers, recognized as effective DI practitioners, modeling DI implementation successfully.
Unawareness of the benefits of heterogeneous student grouping over homogeneous student grouping	Incorporating group work effectively takes time and experience. Therefore, teacher planning time should allow for teachers to collaborate and to share ideas about what grouping strategies are effective within their particular school contexts. At the same time, administrators should understand that when looking for evidence of DI, there is a lot more to it than only group work.
Insufficient training on how to differentiate mathematics for virtual teaching	Ensure that professional development opportunities include training on the available and ever evolving virtual tools that can be incorporated into teachers' DI practice.
Unawareness of how terms used in the classroom to refer to differences in students may affect engagement, learning, and performance in mathematics	Through collaboration with teachers, students, parents, and community members, seek to develop consensus on the use of terms or language used to refer to different groups of students. This will help create a learning environment in which instead of feeling belittled or demeaned, all students can experience a sense of empowerment and confidence.

CONCLUSION

This study illuminates how elementary mathematics teachers understand and experience DI, as well as the barriers they typically face in its implementation. It highlights some important forms of support that teachers require to successfully incorporate DI into their teaching. Research indicates that, when deciding whether to leave their positions, teachers' perceptions of working conditions and job satisfaction have tremendous influence, and principals play the most powerful role in shaping these perceptions (Burkhauser, 2017; Duyar et al., 2013).

Furthermore, studies show that the power principals have in influencing teachers' perceptions of their working conditions and job satisfaction stems from the reach they have in managing the behavior of students, making the safety and needs of teachers a priority, and also acknowledging the effort and accomplishments of teachers (Duyar et al., 2013). Therefore, for teachers to be equipped with the necessary resources and to become proficient in using DI appropriately to improve the engagement, learning, and performance of all their students, it is important for school administrators to recognize the powerful roles they play in helping students achieve the maximum potential benefits that DI has to offer.

Future Research

An avenue of future research for this study will be to explore the perspectives of school administrators to obtain a deeper understanding of their perceptions regarding the role of DI, as well as to gain further insight into the challenges they face and the support they would need to create learning environments best suited for their teachers to implement mathematics DI effectively

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