Advancing Inclusive Mathematics Education: Strategies and Resources for Effective IEP Practices

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Abstract

Personal experiences promoting inclusive mathematics education for my own child have mostly been met with staunch resistance on the part of educators, and a resulting breakdown in collaborative efforts during individualized education program (IEP) meetings. However, I found that utilizing certain strategies and introducing innovative mathematics education resources during the IEP meeting have contributed to a more collaborative and productive meeting toward inclusive practices beyond mathematics. In this article, I describe these strategies, resources, and related processes to guide effective IEP practices and future research.

Keywords: individualized education program (IEP), inclusion, mathematics education, disabilities, educational resources

As a scholar, teacher educator, and ardent advocate for inclusive education, broadly, but with a particular focus on mathematics, I have often felt powerless during individualized education program (IEP) meetings pushing for inclusive mathematics education for my own child. Over the past seven years across two public school districts in two different states, I have attended numerous IEP meetings, mediation meetings, meeting with lawyers, special education directors, and school principals where the final message, whether implicitly or explicitly stated, was: "Your child does not belong in the general education classroom." Their recommendation was to, as with other students in the school district diagnosed with a severe disability, place him in a self-contained special education classroom 100% of the time. Although frustrated with the process and outcomes of the IEP meetings, my experiences led to several pockets of "success" in the school districts moving toward more inclusive education. In this article, I share strategies and resources that I introduced during the IEP meetings that contributed to crucial shifts in developing a more inclusive IEP (in terms of both my child's classroom placement and team members valuing my voice). I assert that these strategies and resources should be used during IEP meetings to set a productive tone, conversation, and direction for the development of meaningful academic and social goals.

These strategies and resources center around three concepts: (1) powerful mathematics minds, (2) goals that support understanding, and (3) math needs students with disabilities. They are also guided by national standards for mathematics practices (e.g., Common Core State Standards (NGAC, 2010) and National Council of Teachers of Mathematics' Principles and Standards (NCTM, 2014)), emerging mathematics education research, Universal Design for Learning principles (CAST, 2016), and funds of knowledge for teaching (Moll, Amanti, Neff, & Gonzalez, 1992). Indeed, these strategies and resources elicit specific and new ways of thinking such that additional resources can be sought, identified, and leveraged to support inclusive practices and to guide future research. I next describe each of the three concepts and detail how they may enacted during IEP meetings in order to advance inclusive mathematics education.

Beyond Strengths toward Powerful Mathematics Minds

Beginning the meeting with a well-thought out discussion and description of the student's strengths, source of knowledge, and preference for learning sets a tone and a path that is very different from a deficit-oriented commencement. This element is consistent with the design of the IEP in asking members to list the student's strength early on in the crafting of the IEP. As such, it provides team members with a frame to build the IEP based on the student's strength. Yet, this is one of the least developed areas of the IEP, effectively diminishing the concept of building upon the student's strength and learning capabilities. Moreover, when strengths are meaningfully articulated beyond "He is a happy boy" or "She has a warm smile", they tend to position students as having fixed mathematics mindsets (Boaler, 2015). For example, describing a student as having "relatively strong" visual learning abilities promotes a fixed understanding of that student to that particular strength with more limited capabilities in other domains (e.g., auditory). Indeed, Boaler (2015) suggested that educators must presume that all students, including students with disabilities, have a tremendous potential for powerful mathematics learning via a *growth* mindset. This presumption is by no means easily subscribed. As such, I found that a resource called *setting up norms in math class* (Youcubed, 2014) is useful to introduce in IEP meetings to better guide the shift from a fixed toward a growth mindset.

The *setting up norms in math class* resource (see Figures 1 and 2) offers seven short, yet

thought-provoking statements about mathematics teaching and learning. In particular, the resource challenges educators, family members, and students to question their own assumptions about mathematics and what it means to 'do math'. Boaler (2015) suggested that by engaging with such resource, individuals deeply reflect on their own experiences as a mathematics learner and begin to see their current role in instilling the message of powerful growth mindsets with their own context. It is important to note that this shift is not sudden; rather it is a gradual process that takes time as individuals make meaning of a paradigm that reframes mathematics education and disability (Tan, in press). Nonetheless, the resource offers a counter narrative of mathematics teaching and learning for educators and students alike. As such, IEP team members may perceive possibilities of inclusive mathematics education as attainable.

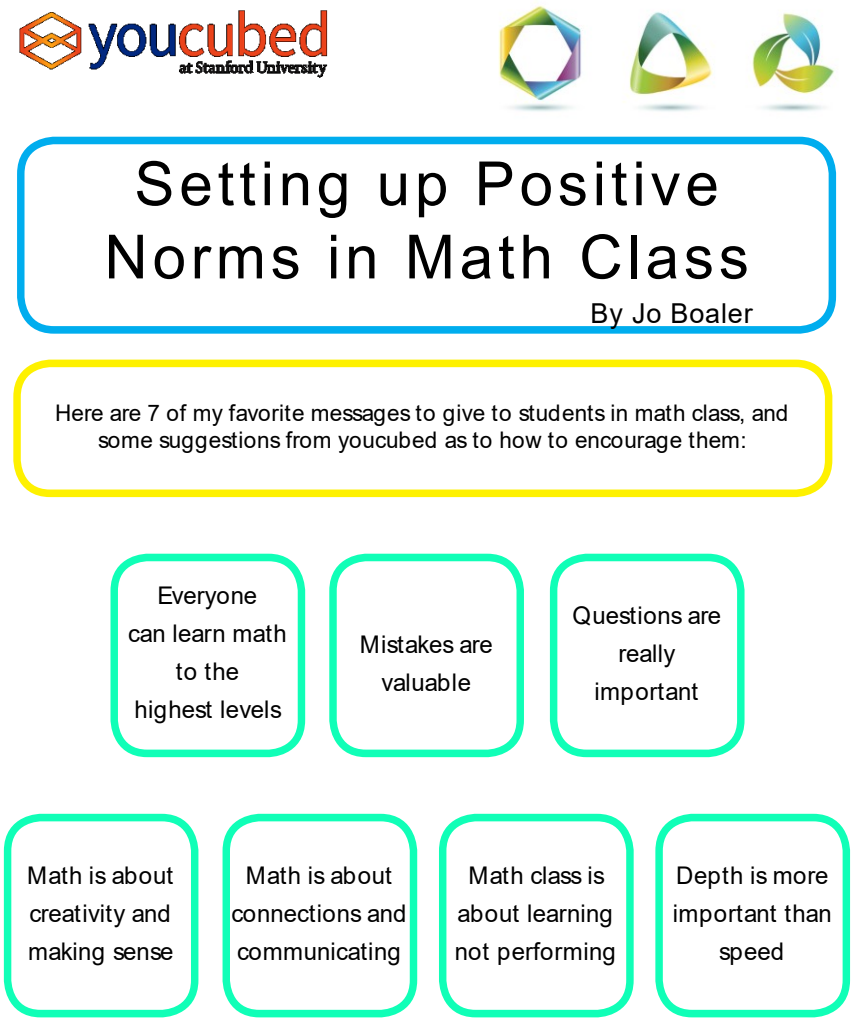

Figure 1. Guiding Growth Math Mindset Resource (Boaler, 2015)

In addition to using this resource, capturing the student's source of knowledge and preference for learning further underscores the student's powerful mind. This is neither a trivial task nor one that could likely be exhaustively described during that specific moment during the IEP meeting when solicited. Rather, this task will likely involve deep inquiry that require exploration and reflection to understand a student's capability. Fortunately, doing so and capturing the student's sources of knowledge and preferences for learning does supplement the new meanings that educators derive from engaging with the resource. Thus, the process involves frontloading IEP meetings with new frames for collaborative thinking that positions the student as a cultural being within a cultural human practice known as mathematics. This process fundamentally departs from the conventional approach that frames, gravitates, and responds to the student's specific disability and deficits in formulating mathematics IEP goals; for example: "He is not able to do X. So, one of the IEP goals should be to teach him to be better at doing X."

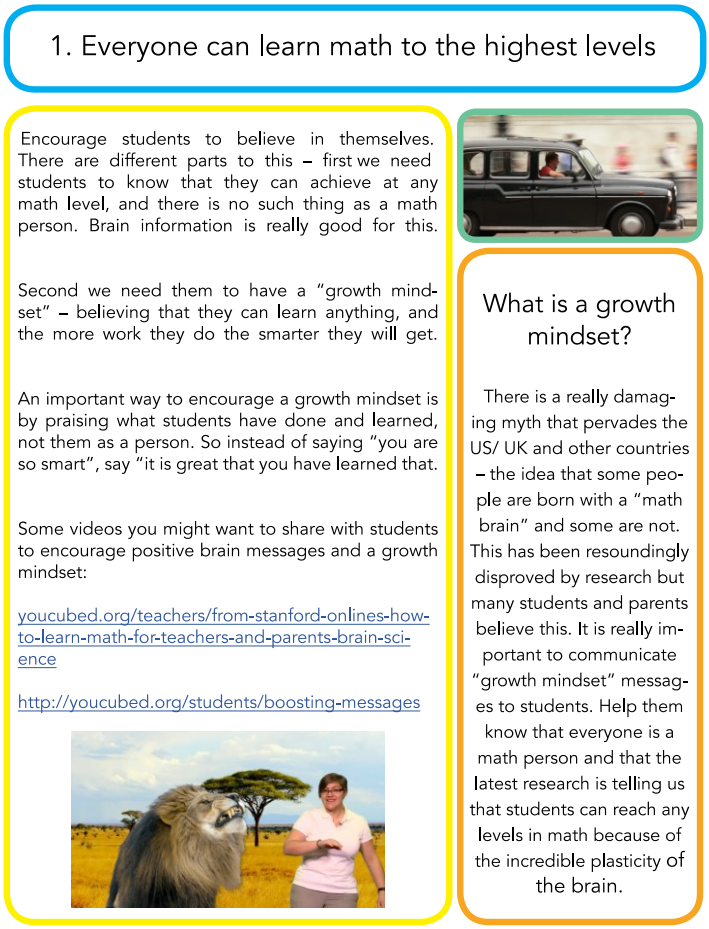

Figure 2. Message Description from Guiding Growth Math Mindset Resource (Boaler, 2015)

In my experience, the process of engaging with this resource and spending a substantial amount of time thinking through and writing down my own child's strengths, preferences for learning, and sources of knowledge helped to navigate a more productive conversation grounded in powerful mathematics minds. Qualities such as "He's a good problem solver", and "He possesses extensive multicultural knowledge" combined with ways that math is framed such as "Math is about creativity and making sense" (Youcubed, 2014, p. 1), positions students with disabilities as crucial members of the mathematics learning community.

Mathematics Goals that Support Understanding

Once discussions of powerful mathematics minds, student's strengths, and funds of knowledge have been established, the IEP team is better positioned to construct potent mathematics goals. Developing deep, conceptual mathematics understanding require certain forms of engagement. In particular, standards for mathematics practices set forth in the Common Core (NGAC, 2010) guides, for example, allow opportunities for students to construct viable arguments and critique the reasoning of others (ccss.math.practice.mp3) and model with mathematics (ccss.math.practice.mp4). Similarly, the National Council of Teachers of Mathematics (NCTM, 2014) call for practice standards that include *implementing tasks that promote reasoning and problem solving*. Internationally, many countries have also centered practices around inquiry and creativity (Marginson, Tytler, Freeman, & Roberts, 2013). Such practices shift much of the source of learning from the teacher to the student by providing students with the opportunities to construct deep, conceptual mathematics understanding. Indeed, students with disabilities who are afforded opportunities to reason mathematically have demonstrated similar sophisticated forms of mathematics reasoning as their non-disabled peers (Tan, 2017; Baroody, 1999; Behrend, 2003; Hostins & Jordão, 2015; Peltenburg, van den Heuvel-Panhuizen, & Robitzsch, 2011; van den Heuvel-Panhuizen, 1996). Yet, most IEP mathematics goals are not developed with powerful opportunities for students to showcase their reasoning, rather goals generally focus on remediating gaps in knowledge (Tan, 2014) or developing fluency in calculations (Barnes, Agness, & Craig, 2015). Consequently, a crucial element of inclusive mathematics education is bridging the divide between what we know about supporting mathematics understanding and the mathematics goals are commonly written in IEPs.

Another useful resource to introduce during IEP meetings is developed by Barnes, Agness, and Craig (2015). This resource (see Table 1) offers a framework to have collaborative and thoughtful conversations in crafting mathematics goals that are guided by nationally sanctioned practices, aligned to daily instruction, target deep understanding, and are tailored to the individual student: "Instead of mathematics views as a disconnected set of skills to be memorized, our teachers are viewing problems as puzzles with multiple solution paths and high levels of critical thinking" (Barnes et al., 2015). This resource also serves as an assessment instrument to monitor short- and long-term progress.

When I introduced this resource during my son's IEP meeting, team members were at first puzzled, but ultimately were determined to make sense of it as we engaged in very productive conversations. The resource made tangible, abstract concepts of standards for mathematics practices. As such, team members had meaningful foundational concepts to build from and from which to use their individual and collective knowledge and expertise. The resource also provided the IEP team with a concrete way to measure progress. Importantly, realizing these potential benefits both for themselves and for my child, team members extended the resource's central

concepts to goals in other content areas such as in science and social studies.

Table 1
Developing Math IEP Goals Tool (Barnes, Agness, & Craig, 2015)

	Partial	**Moderate**	**Strong**
Mathematics Practices: Given a problem to solve, the student will explain and justify their reasoning			
Criterion	Explain their thought process in solving a problem one way.	Explain their thought process in solving a problem and representing concretely, pictorially, and/or abstractly.	Discuss, explain, and demonstrate solving a problem with multiple representations and in multiple ways.
Date			
Comment			
Criterion	Identify the variables and what the problem is asking.	Analyze information (givens, constraints, relationships, goals).	Monitor and evaluate the progress and change course as necessary.
Date			
Comment			
Criterion	Choose a solution path.	Make conjectures and plan a solution pathway. Predict whether solution will be bigger or smaller and justify prediction numerically. Estimate the answer and justify the estimation.	Check answers to problem and ask "Does this make sense?"
Date			
Comment			

Math Needs Students with Disabilities

To maintain the productive momentum into future IEP meetings, I suggest concluding meetings and even starting the subsequent one by articulating a common vision. The two concepts described earlier—powerful mindsets and goals that support understanding—helps to set the stage for this third concept. I took the lead with the vision creation during my child's IEP meeting by sharing a vision that seemingly went far beyond the then current work of the team. I asserted that we as a society need, and will need to solve, many pressing and difficult problems.

Thus, we need students with disabilities to be a part of the solution, to take the lead in the STEM fields, and become productive members of society. Indeed, mathematics and other crucial fields need students with disabilities. Such vision counters the educational rhetoric and deficit-orinted framing that students need math (Gutiérrez, 2013). Individuals with disabilities bring a wealth of knowledge and different ways of knowing that are beneficial to advancing the field. Indeed, such reframing is particularly crucial for students with disabilities whose mathematics programming often lack rigor, positioning them in a passive learning role (Tan & Alant, 2016; Lambert & Tan, 2017; Browder, Spooner, Ahlgrim-Delzell, Harris, & Wakemanxya, 2008; Kroesbergen & Van Luit, 2003). Thus, the IEP team must establish a shared vision in which the goals for the student are derived. While seemingly beyond the work of any one IEP team, the vision I shared resonated to some degree with members of my child's IEP team. At the very least, it is difficult to argue against such a vision.

In my experiences, the vision is often lost in the process of developing achievable short-term and discrete goals. This disconnection is often caused by the hyper-focus on remediating skill deficits (e.g., having a goal of correctly identifying numbers in math for a 5th grade student). To illustrate using my case, the lead special educator teacher felt it was important for one of the IEP mathematics goals to have my son, who was in 5th grade, correctly identify one digit numbers in a field of two. As a math educator and a parent who had 11 years of experience and understanding of my son's general knowledge, I expressed to the teacher, that my son was way beyond identifying and recognizing numbers. These were skills that I had worked on with him and he had already mastered at the age of two. Nevertheless, the argument went back and forth for some time as they were unconvinced of my claims. Yet, my view was ultimately discounted as the teacher and the rest of the team insisted that their goal remain. The stalemate eased once I steered the team to our common vision and our previous conversations about powerful math mindsets. Seeing the disconnect between the goal that was written and the common vision and conversations around math mindsets resources, the team came a realization that much more needed to be done, including working more with the general education teacher in mathematics and identifying resources. Consequently, a shared, bold vision was established in the meeting and this vision served as a basis for continued productive future conversations.

Collectively, the strategies and resources focusing on bold vision, powerful mindsets, source of knowledge, and setting mathematics goals for understanding help shift team conversations from a familiar position to one where current practices and assumptions are challenged. Hence, it becomes important to introduce resources and enact processes that enables educators to showcase their expertise. School administrators who may be present are then able to listen, take action, and offer guidance in leveraging existing resources. As such, their roles shift from a mostly passive IEP team participant with the occasional role of defending the teachers and the school to a purposeful and more comfortable role of providing guidance and enacting changes at the administrative level.

Of importance is the need for researchers to build a strong body of knowledge of IEP strategies and resources, including the ones described in this article, which drives productive IEP conversations toward inclusive mathematics practices. Current research in mathematics education overwhelmingly come to understand students with disabilities from deficit approaches (Lambert & Tan, 2017). Thus, theoretical tools and frameworks such as cultural historical activity theory (Engeström, 1987) and disability studies in mathematics education (Tan, 2014; Tan, in press) will be useful to center concepts such as powerful mathematics minds and shift educational discourse from exclusion to inclusion (Tan, 2014).

Conclusion

As many others will attest, advocating for inclusive education can be difficult and extremely frustrating. The elements I described herein are by no means "magic bullets" for addressing tensions and lack of collaboration between parents and school personnel during IEP meetings. Rather, the elements represent ways to move the conversation during typically contentious IEP meetings, toward a more inclusive, collaborative meeting, and ways to value student knowledge and cultural capital. My own experiences in implementing these strategies have led to modest levels of success with the educators agreeing to continually work to ensure my child's access to and achievement in the general education setting. Perhaps more importantly, in one of the school districts, special education administrators informed me that the conversations that occurred during the IEP meetings have contributed to their considerations for broadening the general education setting to more students and they would reflect such commitment by revising the district's special education mission statement. Indeed, the application of concepts described herein are not limited to IEP meetings involving inclusive mathematics practices, but has broader applicability to the development of any IEP or any school-based meetings that aims to support students and society in achieving its goals.

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