Literature Learning Journal: Part 1

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Introduction

My name is Devina, I am a fifth-year concurrent education student. My journey through the educational landscape has been one filled with curiosity, passion, and a profound appreciation for the art of teaching. Throughout my academic pursuits, I've always enjoyed school, and math has been a subject that effortlessly clicked with me. I attribute this not only to my innate interest but also to the educators who, in their unique ways, catered to my learning style and instilled in me a deep love for mathematics. It was their dedication and innovative teaching methods that kindled my enthusiasm for becoming a teacher.

What excites me most about this course is the opportunity to delve into children's thinking in mathematics, gaining insights into how to support and nurture their mathematical growth. This learning experience will take me on a journey that explores the various facets of mathematics education. I look forward to engaging in mathematics content-based discussions and delving into the intricacies of assessment practices.

One of the aspects that intrigues me the most is the introduction to different types of assessments, differentiated learning, student-led learning, and various grouping strategies. As I step back into the role of a teacher candidate, my hope is to not only enhance my knowledge and understanding of mathematics instruction but also to grasp the significance of catering to diverse learning needs. I aim to discover how to foster mathematical proficiency in my future students and to explore the role of technology in mathematics education.

In essence, I am excited about the opportunities this course offers and look forward to growing as an educator. I hope to learn how to ignite the same passion for math in my future students that my teachers once ignited in me. As I step into this enriching learning journey, I am eager to embrace the challenges and discoveries that lie ahead, becoming a more effective and compassionate mathematics educator.

Week 2: Skemp (2006)

SKEMP, R. R. (2006). Relational Understanding and Instrumental Understanding. Mathematics Teaching in the Middle School, 12(2), 88–95. http://www.jstor.org/stable/41182357

1. How can you differentiate relational and instrumental understanding? Why does it matter to differentiate them?

Today, I delved into the intriguing concepts of relational and instrumental understanding in mathematics, drawing inspiration from Skemp's work (2006). These two terms are like hidden keys to unlock the doors of mathematical comprehension.

I began by exploring the distinctions between instrumental and relational understanding. Instrumental understanding, as my notes state, is like having a magic mathematical wand – it's all about knowing the rule, applying it swiftly, and making those numbers dance to your tune. Relational understanding, on the other hand, is the master key that opens up mathematical mysteries by understanding not just the "how" but the "why" behind these rules. It's about knowing the rule, how to use it, and, crucially, why it works. Skemp himself describes it best, "By the former [relational understanding] is meant what I have always meant by understanding, and probably most readers of this article: knowing both what to do and why. Instrumental understanding I would until recently not have regarded as understanding at all." It's a bit like having the recipe versus truly understanding the culinary science behind it.

But why does it matter to differentiate these two types of understanding? Differentiating these makes it helpful for tailoring teaching approaches, long-term learning, and complex concepts and explorations. Understanding the difference between these two types of understanding allows educators to fine-tune their teaching methods. It's like recognizing whether your students want a quick answer (instrumental) or a deep understanding (relational). As Skemp points out, there can be a mismatch if students aim for instrumental understanding while the teacher strives for the relational. Relational understanding is like planting a tree; it may take time to grow, but its roots run deep. Students who truly grasp why mathematical rules work are more likely to retain their knowledge, connect new learning with past lessons, and tackle novel problems with ease. Some mathematical ideas are like uncharted territories. Relational understanding is your compass and map in these cases. It's about exploring the terrain, unconcerned about the destination, and reveling in the journey.

Understanding these distinctions can also empower teachers to make informed choices,, considering factors like time constraints, the complexity of topics, examination requirements, and the existing teaching culture. Today's exploration into the world of relational and instrumental understanding has given me valuable insights into the nuanced art of teaching and learning mathematics. It's not just about numbers; it's about understanding the "why" behind them that can lead to a deeper appreciation of the mathematical world. And that, in itself, is a rewarding journey.

Other Reflections & Additional Resources

What I Already Knew:

I already knew that relational understanding in mathematics goes beyond simply applying rules; it's about understanding the "why" behind these rules, something I've often experienced as a student. I also understood that instrumental understanding is like having a quick mathematical toolkit for solving problems. But Skemp's insights provided a more structured framework for these concepts, helping me put names to ideas I'd previously intuited.

New Information:

What intrigued me the most was Skemp's idea that instrumental understanding is not really understanding at all, at least not in the deeper sense. It surprised me to see how, for some students and even teachers, possessing a rule and the ability to apply it was all that was meant by "understanding." This sparked a kind of intellectual concern, as it made me wonder about the potential limitations of instrumental understanding, particularly in terms of long-term learning and problem-solving. Skemp's argument that relational understanding provides more depth, adaptability, and connections to previous knowledge resonated with me.

What Caught My Interest:

What really caught my interest was the idea that relational understanding can be a more time-consuming and complex journey, but it can lead to greater mastery, deeper retention, and the ability to tackle new, unfamiliar problems. The notion that it's not just about getting to the answer but exploring the "ins and outs" of why it works fascinated me. I'm someone who loves to dive into the 'whys' and 'hows' of things, so this alignment with a more relational understanding approach resonated with me.

[How Students Learn Math | Relational Understanding Vs. Instrumental Understanding]

Instrumental understanding = having a mathematical rule and being able to apply and manipulate it.

Relational understanding = having a mathematical rule, knowing how to use it AND knowing why it works.

Four advantages in relational mathematics

- More adaptable to new tasks
- It is easier to remember
- Relational knowledge can be effective as a goal in itself
- Relational schemas are organic in quality

Week 3/4: Suh (2007), Groth (2017)

Groth, R. E. (2017). Classroom Data Analysis with the Five Strands of Mathematical Proficiency. The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 90(3), 103–109. https://doi.org/10.1080/00098655.2017.1301155

Suh, J. M. (2007). Tying It All Together: Classroom Practices That Promote Mathematical Proficiency for All Students. Teaching Children Mathematics, 14(3), 163–169. http://www.jstor.org/stable/41199087

2. What is the relevance of each strand of math proficiency? What are some strategies/activities to observe and foster math proficiency? Why/How do these strategies/activities develop students' math proficiency?

Today's exploration into the realms of mathematical proficiency, drawing from Groth (2017) and Suh (2007), revealed an intricate tapestry of concepts, strategies, and activities that promise to enhance students' mathematical understanding and abilities.

I delved into the five strands characterizing mathematical proficiency, as articulated by the National Research Council (2001) in Groth's work. These strands – conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition – provide a holistic view of mathematical proficiency. I realized that these strands are more than just theoretical constructs; they are the quintessential building blocks of mathematical excellence. The five strands don't just promote mathematical understanding; they create math stars – students who shine in the world of numbers.

Conceptual Understanding: Conceptual understanding is the cornerstone of math proficiency. It enables students to grasp mathematical ideas and build connections between new concepts and their existing knowledge. One should use real-life scenarios to illustrate mathematical concepts, making them more tangible and relatable and encourage the use of diagrams, models, and visual representations to help students conceptualize mathematical ideas. These strategies help students see the "why" behind mathematical concepts, making them more likely to remember and apply the knowledge. Visual aids facilitate a deeper understanding. It's all about comprehending mathematical concepts, operations, and relations. It forms the foundation for building new mathematical knowledge and preventing common errors. This strand emphasizes the importance of connecting new ideas to what students already know.

Procedural Fluency: Procedural fluency ensures that students can execute mathematical procedures accurately, efficiently, and flexibly, which is essential for solving mathematical problems. Regular practice of procedures and algorithms to build fluency. Teachers should engage students in problem-solving activities that require procedural skills. These activities foster the application of mathematical procedures, making students more adept at carrying out mathematical operations quickly and accurately.. This is the skill in carrying out mathematical procedures with flexibility, accuracy, efficiency, and appropriateness. It's the practical side of mathematical proficiency, making sure students can not only understand but also effectively use mathematical procedures.

Strategic Competence: Strategic competence involves formulating, representing, and solving mathematical problems. It encourages students to think critically and apply diverse strategies. Teachers should assign tasks that require students to think critically, explore multiple problem-solving strategies, and encourage students to solve puzzles, encouraging them to think strategically. These activities help students become adept at approaching problems from various angles, fostering strategic thinking and problem-solving skills. This strand emphasizes the ability to formulate, represent, and solve mathematical problems. It encourages students to approach mathematical challenges strategically, using a variety of tools in their mental toolkit.

Adaptive Reasoning: Adaptive reasoning is the capacity for logical thought, reflection, explanation, and justification. It cultivates students' ability to think critically and explain their mathematical reasoning. Teachers should encourage students to explain their thought processes, justify their answers, and assign complex word problems that require logical thinking and justification. These activities enhance students' capacity for logical thought and reflection, ensuring they can articulate their mathematical reasoning clearly. This is the capacity for logical thought, reflection, explanation, and justification. It goes beyond rote memorization, fostering deeper understanding and the ability to articulate mathematical reasoning clearly.

Productive Disposition: Productive disposition fosters a positive attitude towards mathematics, making it sensible, useful, and worthwhile. It instills a belief in diligence and one's efficacy. Teachers should share inspiring math stories or literature that portrays mathematics as enjoyable and useful. Teachers should also relate mathematical concepts to real-life scenarios, highlighting the practical applications of math. These activities cultivate a love for mathematics and boost students' self-efficacy, making them more inclined to see the subject as sensible and valuable.The most fascinating strand for me is productive disposition – the habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy. This is where a love for math is nurtured, and it's something I find incredibly valuable.

Strategies/Activities to Foster Math Proficiency:

In Suh's work (2007), various classroom practices were highlighted to promote these five strands. Here are some of the strategies that stood out:

Modeling Math Meaningfully: Encouraging students to represent mathematical ideas in multiple modes, such as manipulatives, pictures, real-life contexts, verbal symbols, and written symbols. It's about helping students make meaningful connections and facilitating the transfer of manipulative experiences to conceptual and procedural understanding.

Math Curse: Jon Scieszka's "Math Curse" illustrated the importance of fostering a productive disposition toward mathematics. This is an engaging way to make math relatable and enjoyable, removing the fear that often surrounds the subject.

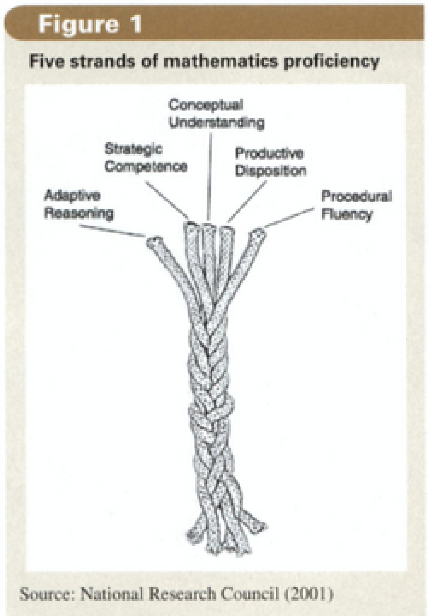
Math Happening: This concept involves real-life problems that can be solved mathematically. It not only strengthens problem-solving skills but also introduces students to the art of problem posing, a crucial mental process.

Convince Me and Poster Proofs: These activities focus on discussion, argumentation, and justification, creating a classroom environment that values students' thinking and fosters reasoning and proof. It encourages students to share and compare their solution strategies and explore alternative solution paths.

These strategies and activities develop students' math proficiency by addressing the various strands from different angles. They allow students to explore mathematical concepts deeply, connect them to real-life situations, and practice problem-solving strategies. They also foster a productive disposition by making math enjoyable and relatable, breaking down the fear barrier.

Today's journey into mathematical proficiency has opened my eyes to the richness and complexity of teaching and learning mathematics. It's not just about equations and formulas; it's about nurturing a love for the subject and equipping students with the skills and understanding they need to thrive in the world of mathematics.

Other Reflections & Additional Resources

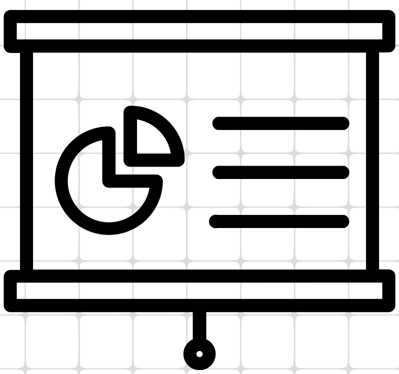


Source: National Research Council (2001)

What Appeals to Me:

What appeals to me most in this exploration of math proficiency is the emphasis on conceptual understanding. The idea of helping students truly comprehend the "why" behind mathematical concepts resonates with me. It's about going beyond memorization and rote procedures and delving into the fundamental principles that underpin mathematics. This approach not only enriches mathematical knowledge but also empowers students to apply their understanding in diverse situations. As someone who values deep comprehension and the ability to connect knowledge across different domains, the focus on conceptual understanding strongly appeals to me.

I'm also intrigued by the strategies and activities that promote a productive disposition toward mathematics. Instilling a positive attitude towards the subject and highlighting its practical relevance can have a profound impact on students. Mathematics often has a reputation for being intimidating, but by making it enjoyable and demonstrating its usefulness in real life, we can change that perception. This approach aligns with my belief in the importance of creating a positive learning environment and fostering a love for learning.



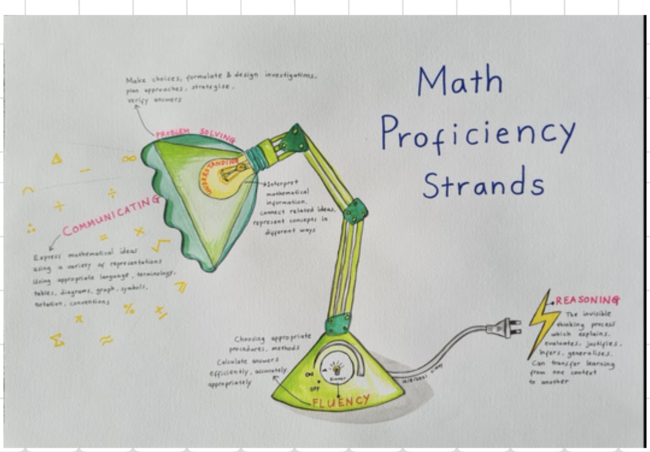
This prezi presentation helped me understand the concepts a bit more deeply! click the icon or this text to watch!

!

What I Want to Learn More About:

I'm eager to explore how these strategies and activities can be adapted for different age groups and diverse student populations. Understanding how to cater to the specific needs and learning styles of various students is a key aspect of effective teaching. Additionally, I'm interested in the research and data that support the effectiveness of these strategies. What evidence exists to show that these approaches truly enhance mathematical proficiency and student engagement? Gaining deeper insights into the research behind these strategies would provide a more comprehensive understanding of their impact.

Furthermore, I want to learn more about how these concepts and strategies can be integrated into modern educational technology. With the increasing use of digital tools in education, it's essential to explore how technology can complement and enhance the strategies mentioned. How can we leverage educational technology to create interactive, engaging, and personalized learning experiences that promote math proficiency and a positive attitude toward mathematics? This intersection of pedagogy and technology is a fascinating area for further exploration.



click to watch!

Teachers: The Five Mathematical Proficiencies

Week 5: Chapter 8- Boaler 2016

3. Why should teachers consider varied forms of assessment in math? What are some possibilities to challenge traditional math assessments? What is the role of comments in assessments?

Today's exploration of varied forms of assessment in mathematics, drawing from the work of Boaler, has illuminated the pressing need to challenge traditional math assessments and rethink their impact on students' learning experiences.

Challenging Traditional Math Assessments

In the American education system, students are subjected to a remarkable degree of overtesting, particularly in mathematics. The traditional approach of narrow procedural questions and multiple-choice answers fails to evaluate the adaptable, critical, and analytical thinking skills that students need in their future endeavors. Major employers, including Google, have questioned the predictive value of test performance, shedding light on the need for a shift in the assessment landscape.

The Importance of Assessment, Comments, & Empowerment

One crucial principle of good testing, as emphasized by Boaler, is that it should assess what is truly important in mathematics. Traditional assessments often focus on narrow mathematics, leaving out essential elements of mathematical understanding. The impact of testing isn't confined to standardized tests; even classroom tests, designed to mimic low-quality standardized tests, can perpetuate the notion that mathematics is about performance, sidelining the richer, deeper aspects of mathematical understanding. The communication of grades to students is another concerning aspect. Students frequently define themselves by their grades, leading to unhealthy comparisons and limiting their self-perception.

In the realm of assessments, comments play a pivotal role in shaping students' understanding and growth. They serve as a means of providing formative feedback that empowers students to take control of their learning and become autonomous learners. Formative assessments, in contrast to summative ones, are designed to inform learning. They help students and teachers understand where the students are in their learning journey and what they need to learn next.

Formative assessment is about empowering students to take responsibility for their learning, self-regulate, and identify areas that require further exploration. Boaler identifies three key components of assessment for learning: clear communication of learning progress, self-awareness of one's place in the learning journey, and guidance on bridging the gap between current knowledge and desired learning outcomes. A major limitation of traditional math classes is the lack of student awareness regarding their learning. Formative assessment encourages students to engage in metacognition, reflecting on what they know, where they are in their learning journey, and what they are yet to explore. The experimental groups that employed varied formative assessment strategies outperformed the control groups on different assessments.

Strategies to Transform Assessment

Boaler offers numerous strategies to challenge traditional math assessments and promote more meaningful, growth-oriented learning experiences. These strategies include self-assessment, peer assessment, reflection time, traffic lighting, jigsaw groups, exit tickets, online forms, doodling, and empowering students to generate their questions and tests. The advice on grading emphasizes the importance of giving students opportunities to resubmit work for a higher grade, using multidimensional grading, avoiding the 100-point scale, and excluding early assignments from the final grade.

The exploration of varied forms of assessment in mathematics challenges traditional assessments, advocating for a shift towards formative assessments and the use of comments to empower students, promote reflective learning, and enhance mathematical understanding. It highlights the importance of assessing what truly matters in mathematics and underlines the negative consequences of narrow, performance-focused assessments. The strategies and advice offered by Boaler provide a comprehensive framework for reimagining math assessments in a way that supports students' growth and nurtures their love for mathematics.

Other Reflections & Additional Resources

Edutopia (https://www.edutopia.org/) is an influential online resource that focuses on educational innovation and reform. It offers a wide range of resources and articles, including insights into effective teaching strategies, assessment practices, technology integration, and social-emotional learning, making it a valuable source for educators and anyone interested in improving education. Edutopia explores evidence-based practices and research findings relevant to assessment, among other educational topics, providing valuable insights for educators seeking to enhance their assessment approaches.

Personally, I explored two articles on the sites: A Powerful Rethinking of Your Math Classroom and Question: Should Classroom Participation be Graded or Not? The latter was more of a blog post where educators posted their opinions on the topic

A Powerful Rethinking of Your Math Classroom

This article focuses on the beginning of the school year, offering educators, particularly math teachers, a valuable opportunity to assess and enhance their classroom practices. It emphasizes addressing math anxiety, fostering a positive mathematical identity in students, and introducing engaging math practices. To achieve these goals, the article suggests strategies such as spotlighting diverse mathematicians, encouraging students to reflect on their math identity, and initiating classes with fun brain teasers that promote problem-solving and critical thinking. Rethinking the assessment process by incorporating regular short assessments and discussions can reduce stress levels and improve long-term retention. Embracing mistakes as learning opportunities, integrating humanities-style discussions, and encouraging writing in math classes can stimulate deeper understanding and reasoning. The article also discusses the "thinking classroom" model, which emphasizes collaborative learning, and how it can enhance critical thinking and problem-solving skills. While these changes may require adjustments, the potential benefits throughout the year are substantial.

Rachel D
October 17, 2023

As a standards based grading school, we do have a category of scores that relates to student work habits. One of these learner development categories is participation and collaboration. As such, every quarter I have to input a grade for this category. However, I think we have to recognize that there are different ways to participate. As a science teacher, I might assess participation on whether students completed a lab and collected data at all relevant stages of the experiment. I might assess participation on a group project – was the student actively working during the activity? We might do a chalk talk, and then the participation is written as students pass a paper around the table. It's important to give students a variety of ways to participate. The main way I assess participation, though, is actually through student provided evidence. In our unit reflection at the end of the unit, students have to provide a short list of ways they have participated in class. It gives them a role in determining how they are assessed on their participation – they might mention raising their hand to answer questions, leaving post-it note feedback on student work, working with a partner on a class activity, always completing their assignments, etc. The students are the ones who know best how they have participated, so why not give them voice in assessing participation if that's something you do?

Question: Should Classroom Participation be Graded or Not?

This comment stands out because it highlights an innovative and student-centered approach to assessing participation and collaboration. The teacher recognizes the importance of acknowledging various forms of participation and understands that students should have a say in how they are assessed. By allowing students to provide evidence of their participation and giving them a voice in the assessment process, the teacher promotes student agency and self-reflection. This approach aligns with a more inclusive and holistic view of assessment, moving away from rigid, one-size-fits-all methods and fostering a more personalized and meaningful learning experience for students.

Other Reflections & Additional Resources Cont.

Before reading this chapter, I was aware of the issues surrounding overtesting and the prevalence of narrow, procedural mathematics questions presented in standardized tests. I knew that this kind of testing often falls short of assessing the adaptable, critical, and analytical thinking skills that students need in the modern world. What's new and particularly intriguing to me is the emphasis on the negative role that such tests play in shaping students' views of mathematics and themselves. As someone who did well in school, I had never thought of how much "being an A-student" truly did affect the way I approached education. After reading this chapter, it gave me a better understanding of assessments that are truly based around what is best for my future students, and not what is easiest to do.

Additionally, the concept of differentiating between formative and summative assessment and using formative assessments to inform learning resonates with me, as it empowers students to take control of their learning. The various strategies for encouraging students to become more aware of the mathematics they are learning, such as self-assessment, peer assessment, and reflection time, offer valuable insights into more effective assessment practices. Finally, the advice on grading, including allowing students to resubmit work for a higher grade and using multidimensional grading, challenges traditional grading methods and sparks my interest in exploring alternative grading approaches.

Week 6: Chapter 7- Boaler 2016

9. What are the benefits of teaching heterogeneous groups? What task and instructional strategies can be used when teaching heterogeneous groups? How is each of these strategies relevant?

Teaching heterogeneous groups offers several benefits, as outlined in both my class notes and Boaler's Chapter 7. These advantages include promoting opportunity to learn (OTL), fostering growth mindsets, and enhancing the learning experience for all students.

Teaching heterogeneous groups offers several benefits, as outlined in both my class notes and Boaler's Chapter 7. These advantages include promoting opportunity to learn (OTL), fostering growth mindsets, and enhancing the learning experience for all students.

Opportunity to Learn (OTL) is a key factor in student achievement. When students have access to high-level content, they tend to achieve at higher levels. However, traditional tracking systems, where students are placed in groups at an early age, often restrict their exposure to challenging material. De-tracking, on the other hand, eliminates these restrictive practices and allows students to benefit from more diverse and engaging learning experiences.

Fostering growth mindsets is another advantage of teaching heterogeneous groups. Such an environment encourages students to believe in their ability to achieve, resulting in improved motivation and behavior. Students working together and experiencing the benefits of diverse perspectives are more likely to develop growth mindsets. In contrast, fixed mindsets are often reinforced in tracked groups, where students of similar achievement levels face challenges or lose interest in math.

To effectively teach heterogeneous groups, instructors should employ various strategies and tasks. These strategies ensure that all students have the opportunity to succeed and grow.

Providing open-ended tasks is essential in multidimensional math classes. Such tasks allow students to explore multiple pathways, propose ideas, connect different methods, use various representations, and reason through different approaches. Open-ended tasks ensure that students are not confined to a single method of success but can explore various mathematical dimensions.

Continued...

Offering a choice of tasks is another approach that acknowledges the diversity of learners. In heterogeneous classrooms, students are not required to work on the same tasks. Instead, they can be offered a variety of tasks that cater to different levels and fields of mathematics. This approach ensures that students are challenged appropriately based on their needs and interests.

Individualized pathways cater to a diverse range of learners. This strategy allows each student to progress at their own pace, delve deeper into topics of interest, or take more time to grasp challenging concepts. It ensures that all students have an individualized learning experience.

Multidimensionality is a key principle in math education. Multidimensional math classes promote the idea that there are various ways to be successful in mathematics. Students are encouraged to ask questions, propose ideas, use different representations, connect different methods, and reason through various pathways. This approach goes beyond one-dimensional classrooms that focus solely on executing procedures correctly.

Assigning competence involves raising the status of students who may be perceived as lower status in a group. Teachers praise contributions with intellectual value and bring them to the attention of the group or the whole class. This approach boosts students' confidence and acknowledges their intellectual capabilities.

Teaching responsibility for each other's learning is crucial in creating a positive group dynamic. Establishing group norms of respect and active listening is essential. Encourage students to discuss their preferences for group interactions and promote a classroom culture where listening and respectful behavior are valued. Justification and reasoning, two essential practices in promoting equity, play a significant role in nurturing responsibility among students for their peers' learning.

Teaching heterogeneous groups with these strategies promotes an inclusive, diverse, and dynamic learning environment where all students can thrive, develop growth mindsets, and experience the benefits of multidimensional math education. These methods go beyond traditional tracking systems and empower students to become responsible for their own learning while supporting their peers.

Other Reflections & Additional Resources

pressure, they think that they are already smart so they dont have to try, dont want to take risks out of fear of not being smart anymore

the school gave in to the pressure and started grouping students in regular and advanced math classes. This change was disastrous, resulting in a huge increase in demotivated students across the achievement range. The school reported that students with similar achievement put into different groups experienced huge problems, and many students developed fixed mindsets about their ability. They also found that students who were advanced started to dislike mathematics, and many chose to drop out of the advanced class, which damaged them further. Within two years the school abandoned the tracking system and put students back into heterogeneous groups.

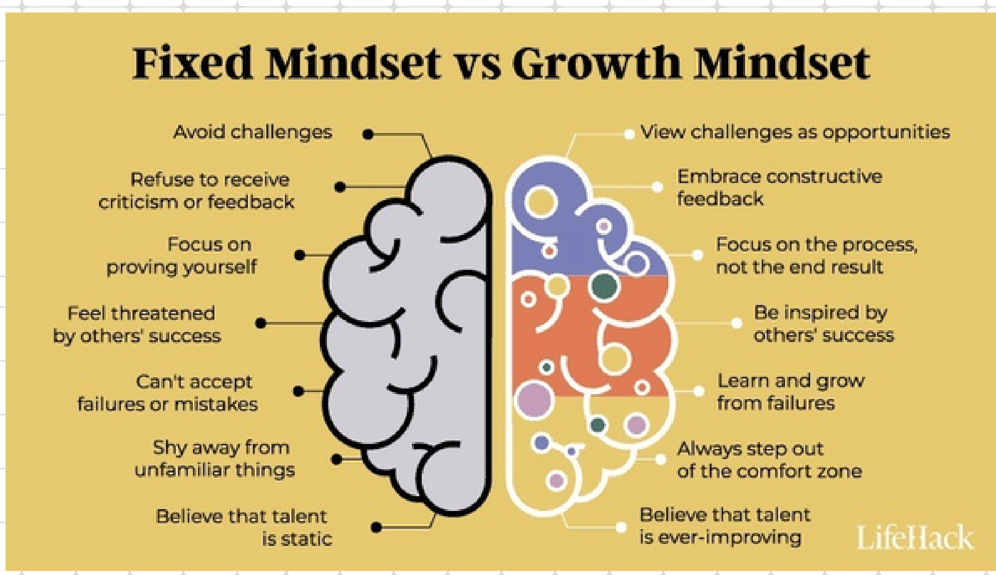
Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. Journal of Personality and Social Psychology, 75(1), 33-52. https://doi.org/10.1037/0022-3514.75.1.33

Click Here to read!

For my additional resource related to this reading, my mind immediately went to this incredible peer-reviewed article I was assigned to read about three years ago. As you can see from my highlight and note that I wrote directly onto the reading, I felt very passionately about this section (Growth Mindset Tracking). Mueller & Dweck (1998) write about how praise for intelligence affects children's motivation. Just like on page 114 of Boaler, this article goes into depth about the fixed mindsets that develop in students. Here is a summary:

Compliments regarding one's ability are typically believed to positively impact motivation. However, in contrast to this commonly held belief, six studies have shown that praise for intelligence has more adverse effects on students' motivation for achievement compared to praise for effort. When fifth graders were praised for their intelligence, they exhibited a greater inclination towards performance goals over learning goals when compared to children praised for their effort. Additionally, after facing a setback, these students demonstrated reduced perseverance in tasks, less enjoyment in the tasks, a higher tendency to attribute their difficulties to low ability, and poorer task performance in comparison to those praised for their effort. Furthermore, children who received intelligence-related praise tended to view it as an inherent and unchangeable trait, while those praised for hard work believed it was amenable to improvement. These findings have significant implications for the most effective ways to foster achievement and also raise theoretical questions about the potential drawbacks of performance-oriented goals and the development of contingent self-worth.

I strongly recommend this reading as it is relevant in many aspects of education. The first time I read this was for my Early Childhood Education studies where we were specifically focused on children's motivation, and has continued to be relevant in my teacher-candidate learning.



Week 8: Hewitt (1999)

5. What is the difference between arbitrary and necessary knowledge? Why does it matter to differentiate them?

Arbitrary knowledge in mathematics refers to information and concepts that students would not be able to discern on their own but need to be informed about. This category encompasses elements such as names, labels, symbols, or conventions that rely on external information for understanding. Students must be made aware of these concepts, memorize them, and establish associations to comprehend them fully. An example is the challenge teachers face when students question the arbitrariness of certain mathematical concepts, including BEDMAS, the number line, or angle measurements.

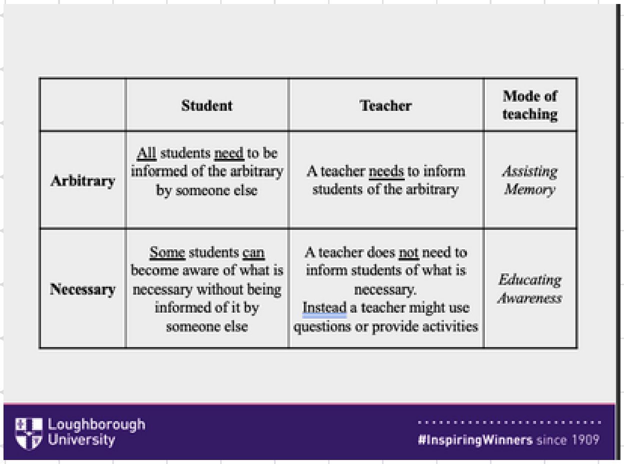
On the other hand, necessary knowledge involves properties, relationships, and facts that students can deduce from what they already know. It is rooted in accepted givens that serve as a foundation for deriving these necessary elements. In this category, students are required to figure out the "why" behind these concepts, and teachers play a vital role in teaching and guiding them in understanding and applying such knowledge. Examples of necessary knowledge include the Pythagorean theorem or finding missing angles, where students need to explore and deduce the principles from established properties.

Givens in mathematics encompass fundamental concepts, principles, or facts that are necessary for understanding and working with mathematical concepts. They provide the foundational knowledge upon which mathematical reasoning and problem-solving are built. Some examples of givens include the number line, basic arithmetic operations, and number facts.

It is crucial to differentiate between arbitrary and necessary knowledge because this distinction guides the teaching and learning process. Educators must help students understand what they need to memorize and what they should think about and deduce. This approach encourages students to use problem-solving techniques effectively and adapt them to various mathematical challenges. By distinguishing between these two categories of knowledge, teachers can support students in developing a deeper and more flexible understanding of mathematics, ultimately enhancing their mathematical problem-solving skills.

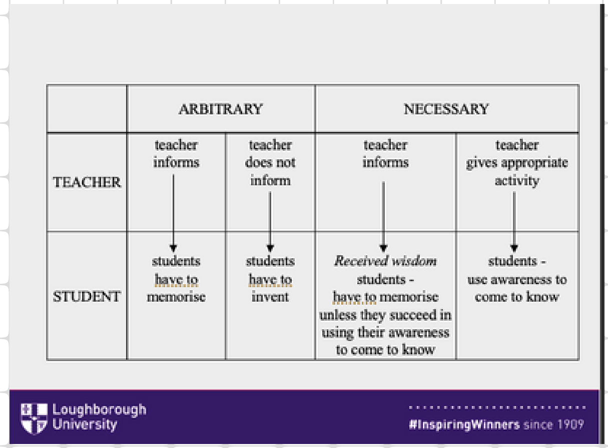
Other Reflections & Additional Resources

Hewitt, D. (n.d.). When to tell and when not to tell: Arbitrary and Necessary. [PowerPoint slides]. Loughborough University. https://www.lboro.ac.uk/media/media/services/lumen/LUMEN%20Arbitrary%20and%20Necessary%20presentation.pptx



	Student	Teacher	Mode of teaching
Arbitrary	All students need to be informed of the arbitrary by someone else	A teacher needs to inform students of the arbitrary	*Assisting Memory*
Necessary	Some students can become aware of what is necessary without being informed of it by someone else	A teacher does not need to inform students of what is necessary. Instead a teacher might use questions or provide activities	*Educating Awareness*

Click the photos to view the slideshow!



	ARBITRARY		NECESSARY	
TEACHER	teacher informs	teacher does not inform	teacher informs	teacher gives appropriate activity
STUDENT	students have to memorise	students have to invent	*Received wisdom* students - have to memorise unless they succeed in using their awareness to come to know	students - use awareness to come to know

The idea that particularly caught my interest and appealed to me in Hewitt's discussion is the concept of teaching mathematics through a strategic approach that leverages students' existing knowledge and familiarity with concepts. This approach aligns with the notion that effective teaching should not rely on concepts or knowledge that students have not yet encountered or fully comprehended. Instead, it emphasizes the importance of building on students' prior knowledge, making the learning process more relatable and accessible.

I found myself agreeing with Merttens' perspective on instruction, which involves giving students a series of procedures while crediting them with their intelligence. This approach assumes that students will not only adopt these procedures but also adapt them to their unique contexts and needs. Understanding, in this context, is not merely about acquiring knowledge but about translating and incorporating it into one's own story, thereby fostering a deeper and more meaningful comprehension of the subject matter.

The idea of guiding students by making a small leap forward and then building a bridge back to their prior knowledge resonated with me. Rather than starting with complex or unfamiliar concepts and working backward, the teaching process can be more effective by beginning with concepts that students are familiar with and then gradually introducing new ideas. This approach aligns with Poincare's perspective, emphasizing the importance of not explaining using concepts that are beyond the students' readily available knowledge.

Aligning teaching with students' existing knowledge and gradually building upon it is a compelling approach that resonates with me. However, the practical challenges of implementing this approach effectively in real classroom settings highlight the need for additional support and resources for educators.

Self-Assessment

Reflecting on my learning commitment during the Fall term in EDUC-5315, I am content with my efforts but remain eager to enhance my engagement further in the Winter term. This self-assessment evaluates my participation, engagement, and overall commitment to the course, which is crucial for achieving my learning outcomes.

Participation is integral to my approach to learning. I believe that active involvement in classroom discussions, group work, and sharing ideas with peers enhances my learning experience. In this course, I have made a conscious effort to contribute actively during every class session. I thrive on the energy of class discussions, which often feel like dynamic brainstorming sessions with my fellow classmates. I genuinely enjoy hearing different perspectives, and when class discussions flow seamlessly, it creates an intellectually stimulating atmosphere that I value immensely.

However, I find my engagement levels to be stronger within the classroom setting than outside of it. Admittedly, I occasionally felt overwhelmed by the volume of readings, given my involvement in a ten-class semester, volunteer hours, and part-time work. While I did manage to complete the readings before each class, there were moments when it felt like I was struggling to keep up. Yet, the classroom environment offered me a sanctuary where I could immerse myself in the subject matter and benefit from the insights of my peers and the professor.

Throughout the Fall term, I have striven to demonstrate unwavering commitment to this course. I have attended each class diligently and ensured that I read the assigned articles before every session. My goal has been to uphold a high level of dedication to my studies, and I believe that, for the most part, I have managed to maintain this commitment. However, I am mindful of my struggles during weeks 5 and 6 when I faced challenges in keeping up with my journals. This brief lapse in commitment had a noticeable impact on my overall performance. It took considerable effort to regain the momentum I had at the beginning of the semester, and I still feel that I have not fully recovered to my initial standards.

Looking ahead to the Winter term, I am committed to making improvements in my learning commitment. To do so, I plan to create a more structured and balanced schedule that accommodates my academic responsibilities, volunteer work, and part-time job more efficiently. This will help me manage my time more effectively and alleviate the sense of being overwhelmed. One significant area of improvement will be my approach to journaling. I intend to stay on top of my journal assignments by either completing them right after class or beginning them just before class. This strategy will prevent them from becoming a low-priority task and keep my reflections fresh and insightful.

I would rate my learning commitment for the Fall term at approximately 80-85%. While I have been dedicated to my studies and class participation, there is room for improvement, particularly in balancing my time and ensuring consistent journaling. I eagerly anticipate the Winter term as an opportunity to further develop my commitment to this course and continue my growth as an aspiring educator.