Annotated Bibliography

Aydin, S. (2014). The role of technology in the teaching linear algebra. *Studies in Modern Society*, *5*(1), 119–130.

Math teachers and professors are always looking for tangible, real world connections to mathematics. A research study looked into implementing online tools and integrate it into higher mathematics, such as linear algebra. The goal was to show math students that there are more mathematical applications than what is shown in a textbook or by doing traditional math by hand. Utilizing online tools to help students learn and apply mathematical concepts is something that is showing promising results. Before, it was really difficult for students to see the direct, real life connections between what they learn and math and the real world. However, students now have a more accessible tool where they can study in places outside of the classroom. Also, as their mathematical understandings deepen, they will be able to apply more of these concepts to things they see and use online. Students will also be able to see how abstract math is applicable to real world situations such as programming. Math becomes more meaningful when students see a direct correlation between what they are learning and how they can apply it.

Jones, J. (2022, September 19) personal communication

Jones is a high school math teacher in San Diego. He has been teaching for close to 20 years. This interview was conducted before our lesson study. He shared that he varies lower level and higher level thinking tasks so students have a variety of skills to work on. He has always worked in a traditional school setting, however he gives students hands-on tasks to make class more relevant and engaging.

Laura Fedeli. (2022). Participation and feedback as motivational triggers: insights from online students' approach to learning. *Journal of E-Learning and Knowledge Society*, *18*(1), 1–9.

The education system drastically changed in 2020 as a result of safety precautions from the pandemic. Classes that typically were a hands-on experience were hindered and, generally speaking, students lost motivation to do work at the same capacity as an in-person course. This study on how online learning affects motivation and participation gave a lot of insight to how we can encourage students to feel more motivated in class, whether in person or online. A study was conducted to dive into what drives student motivation and what teachers can do to push their students to participate. This study showed that there needs to be certain needs met before participating in groups. Social skills, cognitive skills, and self awareness play a major role in a student's motivation and willingness to participate. Students need to feel secure in themselves and their understanding of material to feel secure enough to participate. With these components working together, a student will decide if they are motivated to participate in class activities. The study also notes that motivation is shared amongst peers. When students see their classmates participating, they are more likely to do so, as well. Students also are exposed to different

strategies and entry points into problems when their peers feel motivated to participate. Participants in the study discussed how it became an intrinsic motivator to participate in class when they felt confident in the material and their classmates. When students were online, they felt most secure when they had online tools, such as team chats and discussion forums, that would help them access the material. Similarly, when students in person had the appropriate tools for class, they felt the most motivated to participate in group activities.

Potgieter, E., & van der Walt, M. (2021). Puppetry as a pedagogy of play in the Intermediate Phase Mathematics Classroom: A case study. *Perspectives in Education*, *39*(3), 121–137. https://doi.org/10.18820/2519593x/pie.v39.i3.10

Many educators seek to make their math class fun and engaging for their students. This study looked at incorporating play in the classroom to see how it affected a participant's outlook on mathematics. The research found that teachers are often teaching the way they were taught at that age and are not adapting to make the necessary changes to keep students engaged. Information is becoming inaccessible to students when they find it boring. Educators need to reflect on their own practices to see where they can incorporate new strategies, potentially such as play. The pedagogy of play is based on play being natural,unscripted, and intentional. This means that the educator needs to be fully present but also have a purpose behind the play. It does not make sense to add play time just to add play time; it needs to be well planned like the content lesson. The study concluded that this pedagogical approach can be beneficial inside the classroom and can potentially make great impacts on younger students.

S. Leinwand, D.J. Brahier, D. Huinker (2014). Principles to actions ensuring mathematical success for all. *National Council of Teachers of Mathematics, 1*, 14-24.

This article discussed the different levels of mathematical thinking educators can encourage students to do. Lower demand thinking are tasks such as memorizing, procedural, not making connections to other topics, and are answer oriented. These tasks are often seen in a traditional math classroom and while they are necessary sometimes, they do not encourage students to reach their full potential as a mathematician. Higher demand thinking gives students opportunities to approach problems in different ways, they require a lot of thinking, and answers could be unpredictable since students are trying different entry points or strategies. Student learning flourishes when tasks are high demand more frequently. They are then being pushed to make connections, think critically, and explore math as a subject. This also gives students higher status in the classroom, as learning is in their own hands and not just in the teacher's.

Stein, M. K., Russell, J. L., Bill, V., Correnti, R., & Speranzo, L. (2021). Coach learning to help

teachers learn to enact conceptually rich, student-focused mathematics lessons. *Journal of Mathematics Teacher Education*, *25*(3), 321–346. https://doi.org/10.1007/s10857-021-09492-6

Typically, math has been taught in a very rigid way that does not encourage students to explore different approaches, but to solve problems in the way the teacher teaches. This study focused on co-creating lesson plans. The co-creators of these lessons were a general education teacher and a content-specific coach. This coach offered fresh eyes and new ideas to the general education teacher to help guide them to more intentional teaching, breaking them from their own habits. Researchers of this study are finding, though, that it is really hard to teach students to conceptually understand a new mathematical concept, yet reform on what and how math is taught is necessary. Educators are trying to get away from simply telling students new information. School districts are now bringing in coaches to help educators create curriculum that is meaningful and impactful so that students get more out of math class. Educators co-create lessons with coaches so they can collaborate on ideas, broadening what the teacher might have seen with one set of eyes. The research suggested that this coaching method is improving connections between students and their teacher, as students feel more connected with the content.