Annotated Bibliography

Abdul-Karim, H., Kasimu, O., Rahaman, A., Kanimam, Y. S., Imoro, M., & Dokurugu, M. E. (2023). *Assessing the impact of algebra tiles as visual and manipulative aids on students' algebraic understanding.* American Journal of Educational Research, 11(10), 705–711. https://doi.org/10.12691/education-11-10-9

In this paper, authors discuss their quasi-experiment on junior high students in Ghana, where one school had students use algebra tiles to understand the distributive properties of polynomials, and the other school did not. Results find that algebra tiles were effective in bolstering student understanding, shown by significant difference in performance. I like this article because the Mickelson textbooks in Grade 10, a common textbook used in BC, uses algebra tiles in the polynomials chapter, and I saw physical versions of them in my practicum classroom.

Bada, A., & Akinbobola, A. (2017). Effectiveness of experiential teaching strategy on students' achievement and scoring levels in senior secondary school physics. *European Journal of Education Studies, 3*(12), 552-564.

This article aided us in expanding our definition for experiential learning, and highlighted one of the benefits of experiential learning is that its reflective aspect allows students to personalize their learning. This article also prompted us to start thinking about which students did or did not benefit from experiential learning.

Ball, D. L. (1992). *Magical hopes: Manipulatives and the reform of math education.* American Educator, Summer 1992, 14–18. https://www.aft.org/sites/default/files/ae_summer1992_ball.pdf

This is a paper referenced by several scholars as motivation as to the why and how manipulatives should be used. She goes over her own experiences teaching math to grade 3 students, and uses it to justify why the presence of manipulatives in a classroom is not sufficient. To Ball, the teacher must also be intentional about its use of manipulatives, and must carefully plan around the intentions. She also points out the challenges in balancing the students having room to discover, and careful directions as to avoid misinterpretations.

Basheer, A. (2016). The Effectiveness of Teachers' Use of Demonstrations for Enhancing Students' Understanding of and Attitudes to Learning the Oxidation-Reduction Concept. *EURASIA Journal of Mathematics, Science and Technology Education*, *13*(3). https://doi.org/10.12973/eurasia.2017.00632a

The article explores whether demonstrations are more effective in helping students understand concepts compared to traditional lecture styles, and the results show evident increases in student motivation, interest, understanding, achievements of students with the use of demonstrations. This article would be helpful for us in understanding the benefits of using demonstrations in classrooms.

Bates, T. (2020, June 20). *Lesson 5 - Theories of Learning: Strengths and Weaknesses of Experiential Learning Models*. Tell.colvee.org. https://tell.colvee.org/mod/book/view.php?id=647&chapterid=1130

This chapter in the book explores experiential learning, and explains in detail the definition of experiential learning, as well as the benefits and drawbacks of implementing labs, problem-based learning, case-based learning, project-based learning, inquiry-based learning, and online simulations in classrooms. This informative resource would help us

gain an overall understanding of what forms of experiential learning there are, and the pros and cons of each form of experiential learning.

Communications Team. (2024, May 14). *Why Learning Through Doing is the Best Approach*. Learning Buddies Network. https://www.learningbuddiesnetwork.com/blog-and-news/why-learning-through-doing-is-the-best-approach

This website lists some of the benefits and drawbacks to experiential learning that are not seen in other articles I have found, which I think would be useful in investigating the pros and cons of experiential learning in general.

Holmes, N. G., Olsen, J., Thomas, J. L., Wieman, C. E. (2017). Value added or misattributed? A multi-institution study on the educational benefit of labs for reinforcing physics content. *Phys. Rev. Phys. Educ. Res. 13*(1): 010129. https://doi.org/10.1103/PhysRevPhysEducRes.13.010129

This study aimed to evaluate the added value of lab courses in the university context, but can likely be generalized to include the high school context as well. This article highlighted *how* labs are designed (e.g. cookbook vs. open-ended) and the exact *context* in which they are run (when in the course, type of course) has a noticeable impact on their educational value.

Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*. FT press.

This article offered significant insight into how the definition of experiential learning developed over time and helped us determine which definition/combination of definitions

make most sense to us, which we could then apply to specific contexts in mathematics and physics classrooms.

Larkin, K. (2014). *The when and how of manipulative use in primary mathematics classrooms* [Video]. YouTube. https://www.youtube.com/watch?v=hCGBgedvYAE

This video goes over the theoretical background in the use of manipulatives. My main focus for this video was the discussion on digital manipulatives. Larkin recommends how to use them, and shows examples of their use followed by analysis of its effectiveness.

Leung, A. C.K., Terrana, A., & Jerzak, S. (2016). Students' opinions on the educational value of physics laboratories: a cross-sectional survey. *Canadian Journal of Physics*. *94*(9): 913-919. https://doi.org/10.1139/cjp-2016-0358

This article discusses what educational value, if any, students believe they gain from conducting labs of various formats. While the researchers surveyed university students, some of their findings, such as one of the most valued aspects of lab courses being the opportunity for hands-on learning, very likely applies in the high school context as well.

Marshall, L. (2008). *Exploring the use of mathematics manipulative materials*. Proceedings of the EDU-COM International Conference. Edith Cowan University. https://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1032&context=educom

This paper contains a historical review of the literature around manipulatives in a math classroom setting. The authors also tally responses for how teachers feel about their use of manipulatives in a classroom, giving a numerical perspective on its perceptions.

McKenzie, M., McKenzie, A. (2024). Enhancing Experience through the Integration of Demonstrations and Simulations. In deNoyelles, A., Bauer, S., & Wyatt, S. (Eds.),

Teaching Online Pedagogical Repository. Orlando, FL: University of Central Florida Center for Distributed Learning.

This website explores the benefits of using demonstrations and online simulations in in-person and online classes, which offers us insights in the benefits of using online simulations (like PhET) in classrooms.

Tahiri, Z. (2024). Benefits and drawbacks of project-based learning in upper secondary efl classrooms. *International Scientific Journal Monte*, *9*(2). https://doi.org/10.33807/monte.20243141

The findings of this study helped us determine first what project-based learning is (as opposed to problem-based), and what some of the benefits and drawbacks to this classroom practice are.

TEDx Talks. (2023, July 20). *Experiential learning: the education revolution we need to have | Adrienne Alexander* [Video]. Youtube. https://www.youtube.com/watch?v=Rb_uji4Ge5s

This video explores the importance of experiential learning, the benefits of experiential learning, and some of the road blocks to implementing experiential learning in this classroom such as lack of funding or the practice being undervalued by administrators.

Yuliati, L., Nisa', F., & Mufti, N. (2020). Acquisition of projectile motion concepts on phenomenon based physics' experiential learning. *Journal of Physics: Conference Series*, *1422*(1), 012007. https://doi.org/10.1088/1742-6596/1422/1/012007

This article explores the impact of phenomenon based physics' experiential learning and comments on the benefits and drawbacks of using phenomenon-based learning in physics classrooms, which can help us understand the effects of this form of experiential learning in terms of improving student understanding of the concepts.

Yusof, J., & Lusin, S. (2013). *The role of manipulatives in enhancing pupils' understanding of fraction concepts*. *International Journal for Infonomics*, 6(3/4). Retrieved from https://infonomics-society.org/wp-content/uploads/iji/published-papers/volume-6-2013/The-role-of-manipulatives-in-enhancing-pupils-understanding-on-fraction-concepts.pdf

Yusof and Lusin discuss a study in which manipulatives were used to teach fractions. It justifies the use of manipulatives by a measurable gain in student achievement. I chose this study because I saw a real need to strengthen student understanding in fractions, particularly from students who have been disengaged with math for a long period of time.