

The Effects of Interleaving on Mathematical Understanding

References

Adams, D., and Hamm, M. (2008). Helping students who struggle with math and science: A collaborative approach for elementary and middle schools. Lanham, MD: Rowman and Littlefield Education.

Ball, D. L., and Bass, H. (2003). Making mathematics reasonable in school. In: Kilpatrick, J., Martin, W. G., and Schifter, D. (Eds). A research companion to principles and standards for school mathematics, Reston, VA: National Council of Teachers of Mathematics, pp. 27-44.

Barzagar N. K., and Ebersbach, M. (2019). Distributing mathematical practice of third and seventh graders: Applicability of the spacing effect in the classroom. Applied Cognitive Psychology, 33, pp. 288-298. <https://doi.org/10.1002/acp.3485>.

Bauersfeld, H. (1992). Integrating Theories for Mathematics Education. For the Learning of Mathematics, 12(2), pp. 19-28. Retrieved February 14, 2021, from [suspicious link removed]

Benassi, V. A., Overson, C. E., and Hakala, C. M. (2014). Applying science of learning in education: Infusing psychological science into the curriculum. American Psychological Association. Retrieved from the Society for the Teaching of Psychology web site: <http://teachpsych.org/ebooks/asle2014/index.php>.

Bishop, A. J. (1988). Mathematical enculturation: A cultural perspective on mathematics education. Boston: Kluwer.

Bjork, E., and Bjork, R. (2011). Making Things Hard on Yourself, But in a Good Way: Creating Desirable Difficulties to Enhance Learning. Psychology and the Real World: Essays Illustrating Fundamental Contributions to Society, pp. 56-64.

Borasi, R. (1994). Capitalizing on errors as “springboards for inquiry”: A teaching experiment. Journal for Research in Mathematics Education, 25(2), pp. 166-208.

Brown, A. L., Bransford, J. D., Ferrara, R. A., and Campione, J. C. (1983). Learning, remembering, and understanding. In: Flavell, J., and Markman, E., (Eds), Mussen’s handbook of child psychology, (3). Somerset, NJ, Wiley, pp. 77-166.

Brown, P. C., Roediger III, H. L. and McDaniel, M. A. (2014). Make it Stick: The Science of Successful Learning. Belknap Press.

Carvalho, P. F., and Goldstone, R. L. (2015). The benefits of interleaved and blocked study:

different tasks benefit from different schedules of study. *Psychonomic Bulletin & Review*, 22(1), pp. 281-288.

Casey, A., Fletcher, T., Schaefer, L., and Gleddie, D. (2017). *Conducting Practitioner Research in Physical Education and Youth Sport: Reflecting on Practice*. Routledge, London and New York.

Cobb, P. (1999). Individual and collective mathematical development: The case of statistical data analysis. *Mathematics Thinking and Learning*, 1(1), pp. 5-43.

Davis, B., and Sengupta, P. (2020). Complexity in Mathematics Education. In: Lerman S. (Eds) *Encyclopedia of Mathematics Education*. Springer, Cham, pp. 113-117.
https://doi.org/10.1007/978-3-030-15789-0_28.

Davis B., and Simmt E. (2003). Understanding Learning Systems: Mathematics Education and Complexity Science. *Journal for Research in Mathematics Education*, 34(2), pp. 137-167.

Dewey, J. (1938). *Experience and Education*. Simon and Shuster Incorporated, New York.

Dewey, J. (1986). Experience and Education. *The Educational Forum*, 50(3), pp. 241-252.
<https://doi.org/10.1080/00131728609335764>.

Ernest, P. (1991). *The philosophy of mathematics education*. London: Falmer.

Fisher, J., Hardy, S., and Kong, F. (2019, October). GETCA. Three Teachers, 3000 Problems, and the Quest to Make Math Stick - Interleaving in the Math Classroom [Google Slides].
https://docs.google.com/presentation/d/1-lyKs0xstWldc_slvFUZjMpiEZ869TYap_luu7oy65s/edit#slide=id.g4f9bae8f12_0_0

Foster, N.L., Mueller, M. L., Was, C., Rawson, K. A., and Dunlosky, J. (2019). Why does interleaving improve math learning? The contributions of discriminative contrast and distributed practice. *Memory and Cognition*, 47, pp. 1088-1101.
<https://doi.org/10.3758/s13421-019-00918-4>

Greenwood, J. (1984). My anxieties about math anxiety. *Mathematics Teacher*, 77, pp. 662-663.

Handa, Y. (2003). A Phenomenological Exploration of Mathematical Engagement: Approaching an Old Metaphor Anew. *For the Learning of Mathematics*, 23(1), pp. 22-29.

Henningsen, M., and Stein, M. K. (1997). Mathematical tasks and student cognition: Classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for Research in Mathematics Education*, 28(5), pp. 524-549.

- Hiebert, J., and Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In J. Frank and K. Lester (Eds) *Second Handbook of Research of Mathematics Teaching and Learning*, Charletoote: Information Age Publishing, pp. 371-404.
- Jacobs, V. R., Lamb, L., and Philipp, R. A. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education*, 41(2), pp. 169-202.
- Jefferson, R. N. (2014). Action Research: Theory and Applications. *New Review of Academic Librarianship*, 20(2), pp. 91-116. <https://doi.org/10.1080/13614533.2014.921536>.
- Jörg, T. (2009). Thinking in Complexity about Learning and Education: A Programmatic View. *Complicity: An International Journal of Complexity and Education*, 6(1), pp. 1-22.
- Kapur, M. (2016). Examining Productive Failure, Productive Success, Unproductive Failure, and Unproductive Success in Learning, *Educational Psychologist*, 51(2), pp. 289-299. <https://doi.org/10.1080/00461520.2016.1155457>.
- Kapur, M. (2011). A further study of productive failure in mathematical problem solving: unpacking the design components. *Instructional Science*, 39(4), pp. 561-579. <https://doi.org/10.1007/s11251-010-9144-3>.
- Koedinger, K. R., Corbett, A. T., and Perfetti, C. (2012). The knowledge-learning-instruction framework: Bridging the science-practice chasm to enhance robust student learning. *Cognitive Science*, 36(5), pp. 757-798.
- Kong, F. personal communication, January 30, 2021.
- Kornell, N., Hays, M. J., and Bjork, R. A. (2009). Unsuccessful retrieval attempts enhance subsequent learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 35, pp. 989-998.
- Mason, J., Burton, L., and Stacey, K. (1982). *Thinking mathematically*. London: Addison-Wesley.
- Mason, J., and Davis, B. (2013). The importance of teachers' mathematical awareness for in-the-moment pedagogy. *Canadian Journal of Science, Mathematics & Technology Education*, 13(2), pp. 182-197. <https://doi.org/10.1080/14926156.2013.784830>.
- McLeod, D. (1992). Research on Affect in Mathematics Education: A Reconceptualization. In: Grouws, D. A. (Ed). *Handbook of Research on Mathematics Teaching and Learning*. Maxwell Publishing Company, New York, pp. 574-596.
- Merriam-Webster Dictionary (2020). Interleaving. In: <https://www.merriam-webster.com/dictionary/interleaving?src=search-dict-box>

Ostrow, K., Heffernan, N., Heffernan, C., and Peterson, Z. (2015). Blocking Vs. Interleaving: Examining Single-Session Effects Within Middle School Math Homework. In: Conati, C., Heffernan, N., Mitrovic, A., Verdejo, M. (Eds). *Artificial Intelligence in Education. AIED 2015*. Lecture Notes in Computer Science, 9112. Springer, Cham, pp. 338-347.

https://doi-org.login.ezproxy.library.ualberta.ca/10.1007/978-3-319-19773-9_34.

Rach, S., Ufer, S., and Heinze, A. (2013). Learning from Errors: Effects of Teachers Training on Students Attitudes Towards and Their Individual Use of Errors. *PNA*, 8(1), pp. 21-30.

Rittle-Johnson, B. (2009). Iterating between lessons on concepts and procedures can improve mathematics knowledge. *British Journal of Educational Psychology*, 79, pp. 483-500.

Rohrer, D., Dedrick, R., and Burgess, K. (2014). The benefit of interleaved mathematics practice is not limited to superficially similar kinds of problems. *Psychonomic Bulletin & Review*, 21.

Rohrer, D., Dedrick, R. F., and Stershic, S. (2015). Interleaved practice improves mathematics learning. *Journal of Educational Psychology*, 107(3), pp. 900-908.

<https://doi.org/10.1037/edu0000001>.

Rohrer, D., and Taylor, K. (2007). The shuffling of mathematics practice problems improves learning. *Instructional Science*, 35, pp. 481-498.

Sana, F., Yan, V. X., and Kim, J. A. (2017). Study sequence matters for the inductive learning of cognitive concepts. *Journal of Educational Psychology*, 109(1), pp. 84–98.

<https://doi.org/10.1037/edu0000119>.

Schoenfeld, A. H. (1988). When good teaching leads to bad results: The disasters of 'well-taught' mathematics courses. *Educational Psychologist*, 23, pp. 145-186.

Schoenfeld, A. H. (1994). Reflection on doing and teaching mathematics. In Schoenfeld, A. (Ed), *Mathematical thinking and problem solving*. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 53-69.

Smith, M. S., and Stein, M. K. (1998). Selecting and creating mathematical tasks: From research to practice. *Mathematics Teaching in the Middle School*, 3, pp. 344-350.

Thayer-Bacon, B. J. (2013). Epistemology and Education. In: Irby, B. J., Brown, G., Lara-Alecio, R., Jackson, S. (Eds). *The Handbook of Educational Theories*. Information Age Publishing Inc., pp. 17-27.

Tomlinson, C., A. (1999). *The Differentiated Classroom: Responding to the Needs of All Learners*. Alexandria, VA: Association for Supervision and Curriculum Development.

van Zee, E., and Minstrell, J. (1997). Using questioning to guide student thinking. *The Journal of the Learning Science*, 6(2), pp. 227-269.

Warshauer, H. K. (2015a). Productive struggle in middle school mathematics classrooms. *Journal of Mathematics Teacher Education*, 18(4), pp. 375-400.

<https://doi.org/10.1007/s10857-014-9286-3>.

Warshauer, H. K. (2015b). Strategies to Support Productive Struggle. *Mathematics Teaching in the Middle School*, 20(7), pp. 390-393.

Warshauer, H. K., Starkey, C., Herrera, C. A., and Smith, S. (2019). Developing prospective teachers' noticing and notions of productive struggle with video analysis in a mathematics content course. *Journal of Mathematics Teacher Education*.

<https://doi.org/10107/s10857-019-09451-2>.

Other Articles

Benefits of [Interleaving](#)

[Powerpoint - Harry Ainlay](#)