Self-Reported Student Experiences in a Combined Pre-Service Elementary Education Teacher and STEM Major Quantitative Reasoning Course

Tricia Phillips
University of Alabama at Birmingham

Anne Ho
University of Tennessee, Knoxville

Keywords: quantitative reasoning course, pre-service teachers, student experiences, self-regulated learning, reflective portfolio assignment

We are interested in the self-reported student learning experiences based on written reflections in end-of-semester portfolios. Previous work has looked at the effects of reflective notebooks (Salinas, 2004) or end-of-semester portfolios (Hanush, 2020) on perceptions of prospective elementary teachers in math, both of which had positive outcomes. Others showed increased performance in classes like precalculus (Burks, 2010) due to portfolios, or that portfolios were seen as valuable for pre-service teachers and for departments (Johnson & Koirala, 2013). Keith (1996) highlighted the ability to gain summative evaluation on assignments that involve self-reflection on student learning. Hauk (2005) and John et al. (2020) both analyze student writing to capture students' past math experiences. These studies lay the foundation that portfolios are helpful tools to gauge student perceptions and experiences. Other relevant work includes the mathematical experiences of pre-service teachers (Szydlik et al., 2003); and a look at mathematical beliefs of students (Ward et al., 2010), including comparing majors (Szydlik, 2013). Dias and Santos (2016) found promising self-regulated learning (SRL) in a mathematical portfolio of one high school student but SRL has not been investigated in college level math portfolios. We seek to answer the research question: how does a reflective portfolio assignment in a college level mathematics class reveal students' SRL?

The study context is a quantitative reasoning course that the first author teaches that is intended for elementary education and STEM majors with a focus on students being competent and confident in mathematics, learning not "what to see" but "how to see," and developing the skill of seeing patterns in multiple ways. In this course, students collaborate to build their own understanding, develop solutions using multiple representations of a function, and practice communicating their approaches to a diverse class of peers.

We use SRL (Zimmerman, 2002) as our theoretical framework to examine our research question. We collected data from the final reflective piece of 25 student portfolios, approximately half education majors and half STEM. We performed thematic analysis (Braun & Clarke, 2006) and categorized our codes into different phases of SRL. The Forethought phase (self-motivation beliefs) revealed in student work included codes related to enjoyment, renewed interest, and mindset shifts; the Performance phase of SRL (self-control processes) included codes about problem-solving creativity, approaches, and exploration; and the Self-Reflection phase (self-reaction processes) consisted of codes regarding perseverance, slowing down, and productive struggle. For our poster, we will share the comprehensive list of codes and representative student responses.

We believe this work is beneficial for instructors of similar quantitative reasoning courses at other institutions (e.g. mathematics for the liberal arts or for pre-service teachers) who may be able to implement course features (e.g. reflective portfolios, "menu"-style assignments) into their own courses in order to facilitate SRL processes for students, as well as for scholars who study student writing or SRL. Next steps include comparing student experiences from different majors.

References

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Burks, R. (2010). The student mathematics portfolio: Value added to student preparation? *PRIMUS*, *20*(5), 453–472. https://doi.org/10.1080/10511970802433008

Dias, C., & Santos, L. (2016). Reflective portfolio of mathematics as a tool for self-regulation of learning for high school students. *Revista Latinoamericana de Investigación en Matemática Educativa*, *19*(2), 187–216. https://doi.org/10.12802/relime.13.1923

Hanusch, S. (2019). Summative portfolios in undergraduate mathematics courses. *PRIMUS*, *30*(3), 274–284. https://doi.org/10.1080/10511970.2019.1566185

Hauk, S. (2005). Mathematical autobiography among college learners in the United States. *Adults Learning Mathematics*, *1*(1), 36–56.

John, J. E., Nelson, P. A., Klenczar, B., & Robnett, R. D. (2020). Memories of math: Narrative predictors of math affect, math motivation, and future math plans. *Contemporary Educational Psychology*, *60*, 101838. https://doi.org/10.1016/j.cedpsych.2020.101838

Johnson, P., & Koirala, H. P. (2013). Showcasing students' mathematical understanding through portfolios: A capstone course for mathematics majors on a secondary teaching track. *PRIMUS*, *23*(4), 359–366. https://doi.org/10.1080/10511970.2012.751945

Keith, S. Z. (1996). Self-Assessment Materials for Use in Portfolios. *PRIMUS*, *6*(2), 178–192. https://doi.org/10.1080/10511979608965822

Salinas, T. M. (2004). Effects of reflective notebooks on perceptions of learning and mathematics anxiety. *PRIMUS*, *14*(4), 315–327.https://doi.org/10.1080/10511970408984096

Szydlik, J. E., Szydlik, S. D., & Benson, S. R. (2003). Exploring changes in pre-service elementary teachers' mathematical beliefs. *Journal of Mathematics Teacher Education*, *6*(3), 253–279. https://doi.org/10.1023/A:1025155328511

Szydlik, S. D. (2013). Beliefs of liberal arts mathematics students regarding the nature of mathematics. *Teaching Mathematics and Its Applications*, *32*(2), 95–111. https://doi.org/10.1093/teamat/hrt002

Ward, B. B., Campbell, S. R., Goodloe, M. R., Miller, A. J., Kleja, K. M., Kombe, E. M., & Torres, R. E. (2010). Assessing a mathematical inquiry course: Do students gain an appreciation for mathematics? *PRIMUS*, *20*(3), 183–203. https://eric.ed.gov/?id=EJ883247

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2