

Leveraging Open Educational Resources and Interactive Technologies to Enhance Learning in Undergraduate Mathematics: A SoTL Approach

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This study investigates the impact of Open Educational Resource (OER) modules on student learning and perceptions in a mathematics content course for elementary education majors. Rising textbook costs have created significant barriers to student access and learning (Perry, 2022; Osterman, 2021). Research demonstrates that interactive technologies, such as H5P and GeoGebra, can increase student engagement, motivation, conceptual clarity, and self-managed learning (Shadaan & Eu, 2013). Additionally, OER initiatives have been associated with both academic and economic benefits for students (Thurman, 2020).

Keywords: Open Educational Resources, Teacher Education, Elementary Content Courses

Methods

Fifteen weekly OER modules were developed using H5P and GeoGebra and embedded in the university Learning Management System, replacing a \$45 publisher inclusive access homework platform. Student outcomes were assessed via final exams and surveys measuring engagement, perceptions of learning, self-paced learning, and feedback utilization. Using the Scholarship of Teaching and Learning (SoTL) provides a research-based framework for systematically examining how teaching practices affect student learning outcomes. Additionally, the study explores whether interactive OER activities enhance engagement, understanding, and self-directed learning of undergraduate education majors, and considers how this approach can be applied to other mathematics courses.

Results and Discussion

Initial analysis comparing final exam scores across semesters prior to the OER modules and those using the OER modules indicated no statistically significant difference ($P = 0.1151$), suggesting that students using the OER modules performed comparably to those using the publisher platform. Despite similar performance outcomes, student survey responses revealed strong positive perceptions of the OER activities. Approximately 79% of students reported that the interactive modules helped them learn the course content, 88% valued the ability to work at their own pace, and 94% indicated that immediate feedback encouraged continued engagement. Qualitative feedback reinforced these findings, with students noting that the weekly OER activities were more engaging and beneficial than the traditional platform, increasing motivation and enjoyment in learning.

While OER modules did not significantly alter final exam performance, they positively influenced student engagement, motivation, and perceptions of learning. The ability to work independently and receive immediate feedback fostered self-directed learning and a more meaningful learning experience. Framed through the SoTL perspective, this study illustrates how systematically investigating teaching innovations can provide actionable insights to improve instructional practices and support student success. This model can be applied to other undergraduate mathematics courses, promoting affordable, interactive, and evidence-based teaching approaches that enhance both learning outcomes and student confidence, particularly for prospective teachers.

References

- Osterman, A. (2021). *VIVA: Virginia Course Materials Survey*. vivalib.org
- Perry, M. (2022). *Chart of the Day... or Century?* American Enterprise Institute.
- Shadaan, P., & Eu, L. (2013). *Effectiveness of using GeoGebra on students' understanding in learning circles*. MOJET.
- Thurman, L. (2020). *OER at scale: Academic and economic outcomes of the OER Degree Initiative*. Achieving the Dream.