

THE MULTIPLE USAGES OF THINKING WITH ALGEBRA

David Feikes, Professor, Purdue University Northwest, feikesd@pnw.edu

Natalie McGathey, Professor, Prairie State College, nmcgathey@prairiestate.edu

Sarah Oppland-Cordell, Professor, Northeastern Illinois University, s-cordell@neiu.edu

William S. Walker, III, Assistant Director of CATALYST, Purdue University, wswalker@purdue.edu

Brandon Sorge, Associate Professor, IUPUI, bsorge@iupui.edu

Abstract

Thinking With Algebra (TWA) is a National Science Foundation Project (DUE 2021414) to develop a post-secondary curriculum for intermediate algebra. TWA focuses on six elements that align with building algebraic fluency with conceptual understanding, a mixed review approach, small-group work, and whole-class discussion (Feikes, et al., 2021). Using an equity lens (Oppland-Cordell et al., 2024), TWA is designed for students, including underrepresented students, who need additional mathematical supports at the college level. Seventeen college math instructors attended a workshop on the lessons and pedagogy in order to use TWA in their college courses. Feedback from instructors participating in the TWA first-year faculty workshop indicated that the curriculum was used in many different ways to help prepare students for college algebra and other STEM courses.

Main Themes

The TWA curriculum was intended to be implemented as a standalone curriculum for post-secondary introductory/intermediate algebra courses. However, feedback from a group of seventeen college instructors who attended the first TWA workshop indicated that this was rarely how the curriculum was implemented, and that TWA was used in diverse ways. Some instructors used selected units from the curriculum as the content of a co-requisite course for a college-level math course. Usually, these co-requisite courses are just one credit hour and are offered during the same semester as the college level course. One instructor used TWA as the curriculum for a math summer bridge program. This bridge program targeted incoming college students who either placed below college-level in math or wanted to increase their math skills before the semester started. The focus of this bridge program was not simply to increase math skills, but to increase confidence and build relationships through problem solving. Similar to the co-requisite use, only selected parts of TWA were used in the bridge program. A few other instructors integrated TWA lessons into their current curriculum, along with using small-group and problem-solving approaches learned during the instructor workshop. A few others used the TWA problems or created TWA-like problems to be used as online homework.

A significant question is: Why did instructors use TWA in the ways they did? Based on the feedback, they saw value in the curriculum and the pedagogical approaches, but decided to use it in a way that addressed the needs of their colleges and the needs of their students. Instructors anecdotally reported high levels of student engagement and participation when using these materials, and a willingness to try solving unfamiliar problems on exams due to the mixed review approach. Instructors felt that the focus on the six elements that align with building algebraic fluency with conceptual understanding, equity, mixed review, small-group work, and whole-class discussion helped students learn algebra in a wide variety of formats and prepared them for success in future mathematics and STEM courses.

References

- Feikes, D., Kafle, B., McGathey, N., & Walker, W. S., III. (2021). Thinking with algebra: A project and perspective. In W. S. Walker, III, L. A. Bryan, S. S. Guzey, & E. Suazo-Flores (Eds.), *Proceedings of the sixth annual Indiana STEM Education Conference*. West Lafayette, IN.
- Oppland-Cordell, S., Feikes, D., McGathey, N., & Walker, W. S., III. (2024). Applying a sociopolitical equity framework to a developmental algebra curriculum. In W. S. Walker, III, L. A. Bryan, & S. S. Guzey (Eds.), *Proceedings of the ninth annual Indiana STEM Education Conference*. West Lafayette, IN.