

THINKING WITH ALGEBRA: TWO PROFESSORS' PERSPECTIVES

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Abstract

This research brief will share insights from using the curriculum, Thinking With Algebra (TWA), a National Science Foundation Project (DUE 2021414). The focus will be on the value of using this curriculum when working specifically with students who have taken Algebra I and Algebra II in high school, but were not prepared for college algebra or precalculus. This curriculum is specifically designed for STEM-track students who place below the level of college algebra when they enter college. The authors have found that TWA helps instructors honor the mathematical knowledge and ideas that students bring into the classroom. The curriculum units give instructors the freedom to choose the topics that suit their objectives. TWA also offers a variety of approaches to help students connect with mathematics in a new way. This brief will expand on these themes and report the benefits to students that the authors observed when teaching with this curriculum.

Main Themes

The TWA curriculum addresses the main topics in a developmental algebra course for college students. This curriculum uses a mixed review approach. This includes “review” problems, which allow students to review topics that were covered earlier in the course, helping with retention. Also, there are “preview” problems incorporated throughout. Though not explicitly taught in the unit, these preview problems give instructors a chance to honor the knowledge and skills the students enter the class with, while also opening the discussion if the student exhibits misconceptions. This mixed review approach gives students many opportunities to challenge existing conceptions and reinforce understanding.

Another main theme in TWA is the leveraging of algebraic structure sense (Feikes et al., in review) to give students a new way to interact with mathematics they have experienced in prior classes. This book not only explains what algebraic structure sense is, but it also highlights specific problems from the curriculum that instructors can use to develop this structure sense. The TWA instructor book includes a page of suggestions for each page of the student book. The suggestions include probing questions instructors can ask students, further explanations for problems that are typically challenging for students, and notes regarding content that highlights algebraic structure sense. The following problem types, which are integrated throughout the curriculum, specifically highlight how students use structure sense: rational numbers and rational expressions; factoring expressions specifically using object-process duality (Feikes et al., 2021); problems designed to draw connections between graphs, equations, and numerical data; and problems asking students to anticipate solution strategies and solution formats. In the instructor’s edition, these problems include a description of the structure sense present in the problem so that instructors can help students approach these problems in a new way.

Finally, the curriculum promotes small group work and whole class discussion. This allows students to develop and share mathematical ideas in a safe, low-stakes environment. This can foster self-confidence and show students that learning is more than just getting a correct answer. In fact, true learning happens when students can effectively communicate their thinking to one another.

References

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