Thinking With Algebra, TWA

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TWA Guiding Questions

1. What impact does the curriculum unit have on students' knowledge of algebra?
2. What impact does the curriculum have on students' mathematics self-efficacy?
3. How effective is the professional development in preparing college instructors to use the unit with undergraduate students?

What Makes Thinking With Algebra Unique?

The TWA curricular materials are unique because of the focus on algebraic structure and how it is presented to instructors! The materials provide a review of the theoretical aspects of structure. A key is that algebraic structure is often implicit, we seek to make algebraic structure explicit.

Second, TWA takes a distributed practice approach. Distributed practice provides opportunities for enhanced learning as students reflect on algebra topics learned and make connections with their experience and other mathematical principles before new topics are introduced.

Third, TWA includes small-group work and whole-class discussions. Algebra is a different way of thinking about the world. Small-group and whole-class discussions allow students to make personal connections to algebra topics and learn strategies from other students.

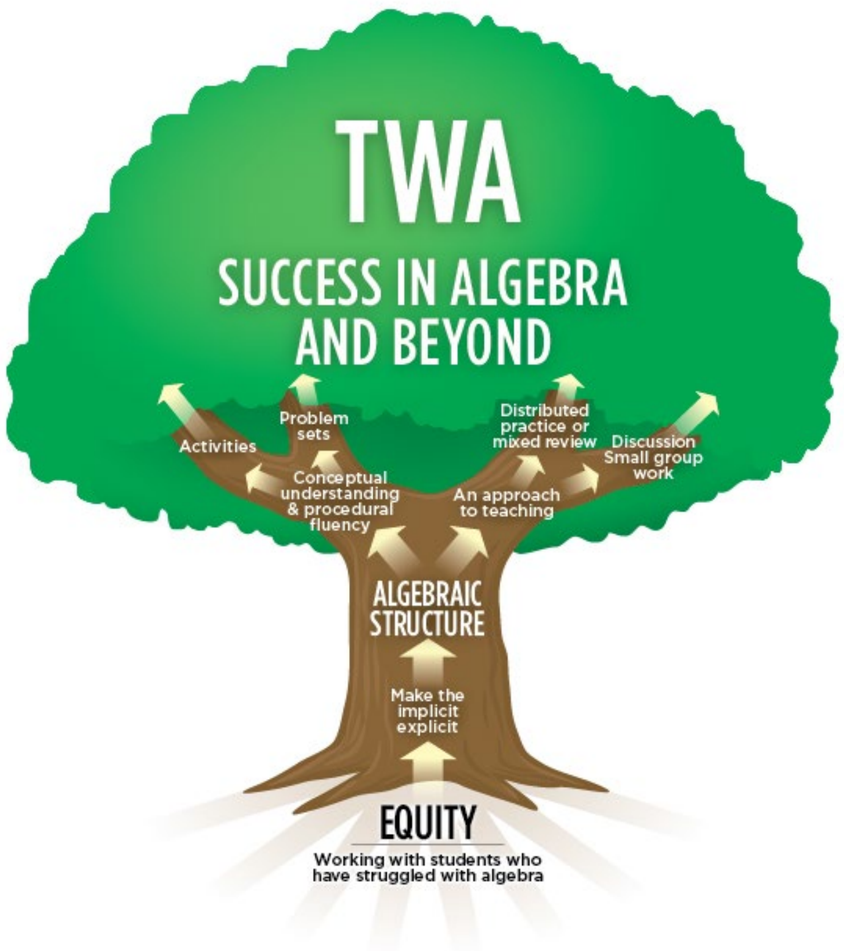
Finally, the project promotes equity for students. The project team has an awareness that the students in these courses have typically not been successful in algebra, they often have less than positive beliefs and attitudes about mathematics. Fundamental to the project are acknowledging students as individual learners and promoting multiple solution strategies that reflect experience and culture.

Preliminary Outcomes

During focus groups around the curriculum, students noted two aspects of TWA:

Importance of classroom activities
- Helped to build confidence
- Provided opportunity to learn from peers

Curricular materials
- Easy to take notes to support learning
- Real world application
- Focus on understanding



Publications and Presentations

Publications

Feikes, D., Walker, W. S., III., McGathey, N., & Kafle, B. (2022). Algebra readiness and algebraic structure as foundational ideas for algebraic learning. In W. S. Walker, III, L. A. Bryan, S. S. Guzey, & E. Suazo-Flores (Eds.), *Proceedings of the seventh annual Indiana STEM Education Conference*. West Lafayette, IN. https://docs.lib.purdue.edu/instemed/2022/briefs/1/

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. https://docs.lib.purdue.edu/instemed/2021/briefs/1/

Workshops and Presentations

April 2022. *Thinking With Algebra*. (Virtual) Illinois Mathematical Association of Community Colleges, State Meeting.

April 2022. *A Holistic Approach to the Teaching and Learning of Algebra*. Indiana Mathematical Association of Two-Year Colleges, State Meeting. Crown Point, IN

March 2022. *Using Algebraic Structure to Design and Algebra Course*. National Council of Teachers of Mathematics, NCTM Regional Conference, Indianapolis, IN.

Jan. 2022. *Centering the Teaching and Learning of Algebra Around Algebraic Structure*. Seventh Annual Indiana STEM Education Conference, Purdue University, West Lafayette, IN

Nov. 2021. *Transitioning from Algebra Readiness to Algebra*. National Council of Teachers of Mathematics Annual Conference, Atlanta, GA (Virtual)

Oct. 2021. *Redesigning Introductory Algebra Around Algebraic Structure*. American Mathematical Association of Two-Year Colleges, Annual Conference, Phoenix, AZ

Jan. 2021. *Thinking With Algebra, (TWA): A Project and Perspective*. (Virtual) Sixth Annual Indiana STEM Education Conference, Purdue University, West Lafayette, IN