

Research Base for Mathworks Curriculum Project “Guiding Principles”

The focus of Mathworks curriculum project is to engage all students in doing mathematics at a high level, and to ensure that the needs of all students are addressed. The Mathworks curriculum project has been established on a foundation of research-based guiding principles that are critical for successful implementation. The bibliography that follows provides links to the underlying research. Research has shown that student success depends on an integrated approach that supports student learning in each of these domains.

1. **Doing mathematics** is about making sense of and thinking deeply about fundamental concepts. Students should learn to “think deeply of simple things,” (Arnold Ross). Students need to:
 - a. Build on prior knowledge by making connections that follow the flow of ideas from what they previously understood to new ideas being studied
 - b. Promote a deep understanding for why things work using visual models
 - c. Focus on the math problems, not the answers
 - d. Reflect on what they have learned to make sense of the mathematics
2. **Persistence** is critical to success in problem solving and doing mathematics. Students need to:
 - a. Develop a “growth mindset,” understand and believe that ability can be developed with hard work
 - b. Be willing to take risks and understand that mistakes present opportunities for learning
 - c. Take ownership of their own learning
 - d. Develop confidence to tackle new situations without giving up easily
3. Teachers need to establish a **classroom culture** that develops students’ curiosity and imagination. The keys to establishing this culture are to:
 - a. Make math interesting, fun and relevant with challenging, well-sequenced problems
 - b. Support student’s productive struggle by responding to student questions with appropriate guidance
 - c. Allow sufficient time for learning ideas deeply
 - d. Use techniques to engage all students
 - e. Balance individual and group work; both can be appropriate depending on the task
4. **Communication** between students and teachers is critical for learning. To facilitate this, teachers should:
 - a. Ask probing questions to develop student understanding, and encourage students to question why things work
 - b. Expect students to present their work and defend their reasoning using precise mathematical language
 - c. Take student attempts seriously, and examine both right and wrong approaches
 - d. Expect students to articulate and explain the key math concepts

What Makes the Mathworks Curriculum Project Unique?

The Mathworks curriculum project is an integrated approach that supports student learning in multiple ways that address the needs of all students. The unique part of the program is its insistence on careful, rigorous attention to each of the areas below:

Curriculum

- The curriculum weaves in algebra throughout in a careful way.
- There is a coherent use of visual models to deepen student understanding.
- Math is transparent in all activities, with a focus on the big ideas.
- The curriculum addresses Texas and national standards in a coherent way.

Teachers

- Teachers need to be aware of their own pre-conceived notions that might impact their teaching.
- Teacher training addresses both content and other factors that impact student learning.
- Teacher noticing is a critical element of effective teaching.
- Teachers themselves develop as active learners as part of a professional learning community, with common planning times that support collaboration.

Administrative Support and School Environment

- The program has administrative support at all levels, including the school-board, superintendent, principal, curriculum specialist, math coach (if present), and teachers, ensuring that there is a consistent program for the students.
- The administration and teachers are all committed to providing an environment that supports student learning, both during the day and after or before school as needed.

Parents

- Parents are an integral part of the program, participating in family math nights, as well as encouraging their own children at home to take an active part in their own learning.