

## Reaching All Students

One of the guiding principles of MiC is that mathematics is a subject—and a way of thinking—that all students can learn. This principle is evidenced in the use of models, in the contexts that make sense to students, and in the valuing and encouragement of multiple solution strategies. However, not all students come to MiC with the same ability to learn mathematics. Some students will need more support for their learning.

In the Reaching All Learners box on the Teacher's Guide page, MiC offers suggestions to make the mathematics accessible and appropriate for students with different learning styles, abilities, and disabilities. The goal of these adaptations is to provide access to the math concepts and skills in the lesson in order to meet the needs of diverse learners and thereby increase their chances of success. Although these suggestions cover the most common accommodations, teachers will sometimes need to redesign and adjust the materials to meet the needs of specific learners.

The following suggestions for reaching all learners are based upon the National Science Foundation supported project *Addressing Accessibility in Middle School Mathematics* at the Educational Development Corporation.

### Guiding Assumptions

- All students can learn mathematics if given proper support.
- All students fall on a continuum of learner differences. Students with disabilities are part of that continuum, rather than a separate category.
- Adapting curriculum and instruction is appropriate for all learners, not just students with disabilities.
- Making adaptations is a collaborative process that involves general and special educators.
- Teachers are responsible for the success of all their students.

### Accessibility Strategies

The *Addressing Accessibility* project identifies three categories of strategies for making mathematics accessible to all students: General Instructional, Curriculum Adaptation, and Classroom Environment. A few examples of strategies in each category are given below.

#### General Instructional Strategies:

- Provide both visual and auditory directions
- Set up a notebook organizational system
- Read aloud
- Offer manipulatives

#### Curriculum Adaptation Strategies:

- Adjust the level of difficulty by the use of friendlier numbers, simple language, or reduce the complexity of the task
- Change the context to make it more familiar
- Provide templates for tables, graphs, writing, and other tasks

#### Classroom Environment Strategies:

- Post homework assignments in a consistent location
- Display wall charts with key vocabulary and information
- Have graph paper, templates available

It is clear that many of these suggestions benefit all students, while others apply to some students with very specific needs.



### Accommodations

Teachers often need to make adaptations to the MiC curriculum materials to address the specific needs of students. The chart below shows categories of student needs followed by a sampling of specific tasks and student needs within those categories and a possible accessibility strategy to address that particular need.

Category of Need	Specific Task	Student Need	Possible Accessibility Strategy
Conceptual	Make generalizations	Finds it difficult to make generalizations and to write rules	Provide rules for the student to test
Language	Follow verbal directions	Has difficulty with auditory processing of verbal information	Provide written as well as oral directions
Visual-Spatial Processing	Read handouts and book pages	Finds crowded pages distracting	Reorganize material into a single-sided handout
Organization	Collect and record data	Records data in a disorganized manner that is difficult to analyze	Use table templates for data collection
Memory	Solve multi-step problems	Does not have needed information in working memory to solve a problem	Break problem into smaller chunks
Attention	Participate in class discussions	Distracts the group	Break into small groups and have them report back to large groups
Psycho-Social	Move through a frustration point	Gets frustrated easily	Check to make sure students have the necessary prerequisites

## Assessment for Special Learners

The leveled assessments provided with MiC make it easy to differentiate assessment and to write educational plans for students. Formative assessment items indicated by the Assessment Pyramid on the teacher pages let you check student progress through the lessons. Success on Level 1 summative assessment problems may be a goal for only some students. Do allow these students to try all items, but be cognizant of the fact that only some students may be successful on the Level 3 items.

The Test and Practice Generator allows teachers to provide more space for answers, change the font size for visually impaired learners, decrease the number of items on a test, decrease the number of items in a multiple-choice answer, change the scales on graphs, use friendlier numbers for problems: many choices and many ways to accommodate the needs of special learners.

## Cautions

There are a few cautions to consider.

- Do not intervene too soon. Expect students to succeed. Unless there is an obvious need for intervention (for example, enlarging a worksheet for a student with a visual impairment), give students a chance to work the problems on their own as written. Student satisfaction follows some struggle with a problem, but do not let the frustration level get too high.
- Do not lose the integrity of the mathematics. Teachers need to know the goals of the lesson and the entire unit. Some concepts are required for all students; do not eliminate these vital topics for any students. Professional development and planning with other teachers can help in identifying the critical mathematics.
- Do not reduce the mathematics to skill sets. In an effort to help students who struggle, it is common for teachers to intervene and reduce the problem to a set of procedures to be followed with the result that they take away all the thinking. Understanding the concept is important to learning and retention of concepts.

- Do not eliminate the investigative nature of the mathematics. Remember that a goal of MiC is that students be able to mathematize their world. This requires investigation, conjecture, discussion, and justification. Try not to scaffold the problems so deeply that no investigation is required.

## Working with Advanced Students

Special learners include those who are very talented in mathematics. The Reaching all Learners boxes in the Teacher's Guide will often make suggestions for ways to extend the lesson through additional challenging questions, problems, or investigations. Innovative ideas for challenging these students are also suggested in the Hints and Comments section of the Teacher's Guides.

Teachers may find that students want to move ahead and go directly to formalization. This is clearly suitable for some students; do not insist that they do every problem or use only informal strategies. Make use of the Level 3 assessments that are embedded within the lessons. Use the special projects and enhancement activities. *Number Tools* and *Algebra Tools* also offer some challenging problems; ask students to try to design similar problems or to prove their generalizations.

The curriculum design allows students to progress at their own level of understanding. Progressive formalization, moving from informal to preformal to formal, occurs at different rates for different students; the curriculum design supports all student learning.

