

Pacing Considerations in a Contemporary Mathematics in Context Classroom

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The courses in the *Contemporary Mathematics in Context (CMIC)* curriculum are designed to be presented at a realistic, flexible pace. Some teachers implementing the curriculum, however, express concerns about not completing all the material in a course during the academic year. Beginning *CMIC* teachers often raise the following questions:

- *How can I pick up the pace in my classroom?*
- *How do I decide what is most important in each unit and in the course?*
- *How do I know that students understand the concepts so I have the confidence to move on?*

These questions stem from teachers' concerns for student learning. Since pacing issues can affect student learning, which in turn affects evaluation of both the mathematics program and the classroom teacher, it is worthwhile to think carefully about these issues.

District decisions as well as individual teacher decisions affect the amount of material that can be effectively taught each year. Districts and teachers who are implementing the *CMIC* program have found effective strategies for addressing pacing issues.

KNOWING THE CURRICULUM

Elementary schools, middle schools, and high schools sometimes make curriculum decisions in isolation, without considering the common goals for a K-12 mathematics program. Because a district invests time, energy, and financial resources in implementing *CMIC*, it is advisable to think about the mathematics curriculum from Kindergarten through high school.

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Questions for each district to consider
include the following:

- *Are students developing mathematical habits of mind and good work habits in earlier grades?*
- *How do mathematical expectations for students align from Kindergarten through high school?*

Middle school backgrounds

If students come to high school knowing how to collaborate with classmates, to investigate complex problems, to explain their mathematical thinking, use graphing calculators, and understand more than arithmetic, they are well prepared to complete the *CMIC* courses in a timely manner.

In cases where the middle school mathematics programs have not prepared students well or when classroom hours for mathematics instruction have been reduced (in some block scheduling formats), completing Course 1 in a single year may *not* be a reasonable goal.

The mathematical content in Course 1 was chosen because the authors considered it to be the most important mathematics for students to know by the end of ninth grade. Each course sets high but attainable stan-

dards that were tested prior to publication. To provide even greater pacing flexibility, the materials are published in two parts. A second-year class can complete Course 1, Part B, while a new, first-year class begins with Part A. Developing understanding of important mathematics should not be sacrificed to "covering" the content.

Resources of CMIC

Because the *CMIC* curriculum is an integrated curriculum, careful study is necessary to determine where concepts and methods are introduced, developed, formalized, and revisited. It would be unrealistic to expect that all teachers would have time to study the four years of the curriculum before beginning to teach Course 1. There are, however, resources to help teachers begin to understand the full curriculum. The *Scope and Sequence* pamphlet identifies the course level and unit in which topics are taught in the three-year curriculum and which major topics are reserved for Course 4. Information about the development of mathematical ideas across mathematical strands and across courses is also contained in the *Teacher's Guide*. Having access to the *Teacher's Guide* for all courses allows teachers to understand the detailed development of mathematical concepts within the curriculum.

MANAGING A NEW PEDAGOGY

The *CMIC* curriculum requires that students make sense out of problem

situations and explain their thinking. If one of the major goals of your mathematics program is to develop students' problem-solving abilities, increasing the classroom pace may take

Having access to the Teacher's Guide for all courses allows teachers to understand the detailed development of mathematical concepts within the curriculum.

away opportunities for students to think deeply about mathematical ideas. Whether deciding to move students along more quickly by asking probing questions, providing hints, or directly instructing students about an idea, each instance should be carefully analyzed in terms of decreased opportunities for problem solving and critical thinking.

Time for collaboration

One factor that some teachers indicate slows their progress is the number of interesting questions that students ask. Decisions regarding whether to follow up on additional questions need to be made in light of the desire to encourage ownership of learning by valuing students' questions, the mathematical value of the questions, and time constraints.

Efficient group work

Of course, groups of students who collaborate efficiently will complete their investigations more quickly than other groups. Organizing and facilitating productive group investigations is an important key in successful pacing of a course. Some districts provide additional professional development for their mathematics teachers in collaborative learning. Information on collaborative group work is provided in the *Implementing the Core-Plus Mathematics Curriculum* booklet included with the *Teacher's Resource Package*. Group self-assessment prompts are provided in the *Teacher's Guide* for use following Checkpoints. Often, students will have good insights into ways to make their own groups function well.

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Efficient plans for technology

Another implementation decision that affects pacing is the availability of graphing calculators for students' use. Students frequently need access to graphing calculators to complete homework. Some districts provide students with an "at-home" graphing calculator along with the textbook. Other districts make multiple calculators available for overnight check-out from a classroom teacher or from the school librarian. Business or industry contacts may be willing to adopt a classroom and provide technology resources. In some cases, districts request that students purchase their own calculators and may provide financial assistance with rent-to-own programs. By having access to technology at all times, students become more efficient with technology. They are then able to complete more work during the class session as well as more homework.

TIPS AND STRATEGIES FROM CMIC TEACHERS

Experienced *CMIC* teachers have developed a variety of specific strategies to assist them in pacing courses, units, and daily investigations. Some of these strategies are listed below:

- In Course 1, assess students' understanding of material from their middle school mathematics program to avoid repetition.
- With other teachers in your department, create a schedule for completing units for the year. Collaborate so that all teachers of the same course continue at about the same pace.
- Know the objectives for each lesson so that you do not get sidetracked. Know whether a concept or skill is being introduced or whether mastery is expected.
- Students should not need to write complete answers to every activity in an investigation. Some activities are for scratch work and discussion. Complete write-ups should be made for Checkpoint questions, in students' Math Toolkits, and for MORE tasks.
- Selectively facilitate mini-checkpoints before the main Checkpoint to consolidate the learning and allow students to move efficiently through the remainder of the investigation. (This may also help bring a lagging group up to speed.)
- If an investigation is not completed during the class period, students may begin the next activity at home and discuss results with their group at the beginning of the following class period.
- Assessment of student understanding by listening to group work may prompt instructional decisions such as omitting an upcoming activity because students already understand the concept or facilitating a whole-class discussion to clarify student thinking.
- Assign On Your Own tasks for outside class work.
- Assign MORE tasks selectively as students are working through the lesson.
- Resist the temptation to go over all the assigned MORE tasks in class. Reserve class time for the important Organizing tasks. If students have chosen different tasks, students who have chosen the same task could present their solutions for the entire class.

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BELOW ARE SOME SPECIFIC SUGGESTIONS FROM CPMP TEACHERS:

- “Become very familiar with the new curriculum.”
– *Cathy Helmboldt, Sparta High School*
- “Trust the curriculum. You *can* move on. The important topics will come back again. It took me a while to figure this out. In fact, it was my students who finally enlightened me. They said, ‘Dr. Triezenberg, you don’t need to tell us things after we do the investigation.’ I was losing valuable time by ‘reteaching’ concepts.”
– *Don Triezenberg, Holland Christian High School*
- “Emphasize group roles daily. Otherwise, students quit using them and subsequently quit working together.”
- “Sit back and let your students do the thinking. I am constantly amazed at what students can do and figure out when I let them work.”
– *Karen Fonkert, Orchard View High School*
- “When assigning an investigation, give time limits. Say, for example: ‘You have 12 minutes to do Problems 1 through 5,’ or ‘Two more minutes on this Checkpoint.’ Students really push it when they have a limit.”
- “Make sure that you do every problem yourself before assigning it. Don’t feel like you need to assign every MORE task and don’t go over every homework problem you assign. Make yourself available before school for questions.”
– *Jennifer Diekevers, Caledonia High School*
- “Don’t change your groups too often. Give your groups time to gel. Members from groups that finish more quickly can be used as resources for the other groups.”
- “Don’t wait for every group to complete an investigation every time.”
– *Bob O’Connor, Lakeview High School*
- “Some topics can be chunked. One group could do #1, another group could do #2, and so on.”
- “Using overheads or the Checkpoint at the beginning of the hour to wrap up things I observed students doing the previous day has helped get students quickly back into the investigation. It has also helped clarify some of the misconceptions students have.”
– *Mark Tompson, Kent City High School*

Teaching the second, third, and fourth courses in *CMIC* helps teachers understand the development of concepts and methods, the retention of concepts by students across courses, and the varying level of mathematical understandings gained by students at any given time. These understandings give teachers the confidence to make many specific teaching decisions that affect pacing.

Helping students develop mathematical habits of mind requires students to have many opportunities to wrestle with problems, justify their reasoning, and explain their thinking. Understanding how concepts are developed and how skills are mastered during the *CMIC* three-year core program of study, using some of the strategies above, and making judicious choices in facilitating

collaborative work will enable teachers to help students learn important mathematics in sense-making ways so that students can, in turn, make sense out of new situations and solve new problems.

