



Principles of Course Design

The CPM middle school and high school core courses—*Making Connections: Foundations for Algebra, Courses 1 & 2*, *Algebra Connections*, *Geometry Connections*, and *Algebra 2 Connections*—were designed and written based on several fundamental learning principles. An outline of those principles (in bold) and their implications in the course design are described below.

- **Mathematics is a coherent intellectual system, not a collection of disjoint facts, and needs to be taught in a way that makes this coherence clear.** The *Connections* courses emphasize the connected nature of mathematics. Each course consistently weaves strands of topics together so that the connections emerge naturally and can facilitate deeper understanding.
- **Curriculum works best when it is successful with all students, including “traditionally struggling students” and “accelerated” students.** Therefore, the *Connections* series makes each course challenging and engaging for all students from the very beginning. This approach not only builds stronger study teams (because in order to promote mathematical discourse among the students, study teams need something to talk about), but also helps to reduce status issues from the start (e.g., “Jimmy can do these problems quickly on his own so he must be smart and I am not.”). Through the use of challenging problems, accelerated students are pushed to learn more and are not lost to boredom, while “traditionally struggling students” are actively engaged in the work of developing solution plans and executing them. They become an integral part of the study team.

At the same time, to support students with weaker skills and learning gaps, these courses build the conceptual foundation slowly with an emphasis on manipulatives and looking at problems in multiple ways. The “mastery over time” approach helps “traditionally struggling students” build understanding over time and accommodates different learning styles.

- **Teachers teach better when curriculum materials are flexible.** The *Connections* authors have specifically designed many of the guided investigations so that teachers can choose an open-ended approach or select the “further guidance” problems for their students. Chapter closure is designed to offer choices for teachers depending on their students’ needs and the time available to them for closure.
- **Structured investigations and lessons are more successful when students clearly understand what they are looking for.** Each lesson in the *Connections* courses begins with an introduction that lays out the learning goals. In addition, lessons are written so that students understand the purpose and goals of the task to enable them to sharpen their focus. Attention is also paid to helping students recognize the framework of what they are learning, such as using a representation web.

- **Students learn more when they solve problems and discuss their thinking with others.** This research-based principle is incorporated into the design of the CPM *Connections* curriculum by having students collaborate in study teams. The teacher manages and supports learning while guiding students toward the mathematical objectives of the lessons.
- **Teams work better when the work actually requires a team and there is something to talk about.** The *Connections* courses are specifically designed to have class work that is challenging for all students so that students must problem-solve together. Each student has a specific, defined role in the solution process. These specific responsibilities eliminate the potentially damaging team behavior of having one student solve the class work problems and then “teach” or “tell” the other students in the team how to solve them.
- **Closure is a vital portion of a lesson.** Closure is incorporated into each lesson. Sometimes the closure activity consists of reflective writing while other times the Teacher Editions offer suggested questions the teacher can use to facilitate a whole-class discussion.
- **A student’s learning is more meaningful and is better retained when he or she reaches the level of understanding necessary to explain and justify his or her thinking.** The *Connections* courses emphasize asking students to justify their mathematical thinking and problem-solving approaches to help foster long-term retention of what they learn.
- **A mathematical text should have usable reference elements.** The text design allows teachers, parents, and students to access information through indices, glossaries, and by referring to problems in a manner that helps everyone find the problem or lesson. All major concepts are eventually consolidated in Math Notes boxes, which include definitions of key mathematical terms, as well as examples for how to solve certain types of problems. Every lesson is structured similarly (introduction, problems/investigations, closure, Math Notes box (when appropriate), and homework) so that students know where to look for what they need.
- **Literacy can be strengthened through meaningful/rigorous mathematical study.** The *Connections* series supports students’ growth in reading and writing literacy. The student text is written in an even voice with consistent language usage to help students who are challenged with reading. Students are also given regular opportunities to develop and practice their writing skills through reflections and explaining their understanding. The bulk of the reading is done during class time when students have the support of their team members and the teacher. Homework assignments require much less reading. The Lexile scores for the books support the readability of the texts for their intended grade levels.
- **The structure of the lessons and layout of the textbook help students focus on mathematics and eliminate distractions.** The consistent structure of each lesson, homework set (“Review and Preview”), and chapter closure section help to make students comfortable and confident with the lessons. The use of one color printing with illustrations specific to the problems (or that are a course icon) avoid the distractions of random pictures, multiple color splashes, and layers of highlighting. These techniques divert the students’ focus from the mathematics in the lesson and create more confusion than clarity. The “color” in the book is the excitement and engagement of the students with mathematics.