Across all content areas, the CUNY Start program believes that students must be active in the classroom in order to learn most effectively. Accordingly, CUNY Start math classes should emphasize “student talk” over “teacher talk”, with practically no lecture-based instruction. Students should be given great responsibility for developing, testing, explaining, and assessing mathematical ideas and answers.

We believe that math is not limited to a set of procedures, but involves relationships between concepts, procedures, and conventions. As a result, CUNY Start instructors are asked not to present rules or procedures to students. Instead, teachers should stimulate student thinking through discovery-based activities and skillful questioning. That way, students can construct their own mathematical understanding. Our aim is for CUNY Start teachers to foster students’ ability and willingness to think and communicate like scientists — to be inquisitive, investigate relationships and patterns, make conjectures and generalizations, test their ideas, draw conclusions, and think critically.

We tell students on the first day of class that our goal is for them to develop the “language and thinking of mathematicians”. So we prioritize discussing and understanding mathematical concepts in depth rather than merely memorizing and applying algorithms and shortcuts mechanically. In CUNY Start math classes, we do not focus primarily on whether students’ answers to math problems are right; in fact, their explanations and ideas are valued more highly. We believe that students build confidence and understanding best when they are asked to explain their thinking and assess ideas themselves.

In order for instructors to apply these ideas and values about teaching and learning, the following teaching practices are central to CUNY Start’s approach to math:

**Student-Centered Instruction**
- Asking students to explore, explain, and discuss ideas among themselves, instead of explaining ideas or demonstrating procedures ourselves (as in a traditional lecture).
- Giving students the responsibility for assessing and correcting each other’s math ideas, answers, and language by not giving away whether students are right or wrong through facial expressions, tone of voice, hesitating, or not writing students’ responses on the board.
- Allowing students time to struggle with math problems and ideas on their own without the teacher “helping” too much or too soon.
- Letting students think and speak for themselves and listen and respond to each other, without rephrasing or even repeating what they say, explaining what they did, providing reasons or steps for them, or reframing their ideas.
- Valuing and encouraging different methods of solving problems that students use.

**Questioning**
- Asking meaningful questions and posing well-conceived examples in order to stimulate student thinking and discussion.
• Relying almost exclusively on questions (making as few statements as possible) throughout math classes.

• Asking questions that are as open-ended as possible (so that ideas and problems are not framed much for students and they have to think and explore ideas themselves), but as specific as necessary (so that it is clear what is being asked).

• Varying the questions that we ask, both in general to keep students listening and thinking and specifically when one line of questioning proves fruitless.

• Posing more accessible examples when students are truly stuck or confused so that they can make connections between what they already understand and more challenging concepts or problems without the teacher providing explanations or leading questions.

• Directing most questions — especially about a specific student idea or answer — to individual students (not to the class as a whole) for more useful assessment of what they really know and understand.

**Developing Real Understanding**

• Asking about concepts, pushing students to justify their ideas, and not letting them merely recite answers, procedures, and vocabulary involved in a problem.

• Pushing students to be clear and accurate with their language while leaving room for them to talk about math ideas informally.

• Intentionally bringing out common misunderstandings and errors without indicating that they are wrong so that students examine them, really think about them, and develop clearer comprehension.

**Other Practices**

• Getting every student in a class to participate and explain her/his ideas — asking questions of all students, not letting either the most vocal students dominate discussion or the least outgoing students avoid talking, while also helping students feel safe and comfortable taking chances and making mistakes.

• Helping students to feel safe and comfortable taking chances and making mistakes, and to know that they do not need to master an idea as soon as they first see it.

• Encouraging student note-taking, requiring use and organization of math binders, and helping students learn to refer to their binders/notes.