MATHEMATICS

All people must be able to think and reason mathematically to be able to compete in a technologically changing world. We believe all students possess the innate power to do this. The goal of teaching mathematics at every level is to help all students develop mathematics power. Mathematics is the basis for science and technology. Mathematics is the key that opens the door to many careers.

To equip students for productive, fulfilling lives in the Information Age, school mathematics has been redefined to address the current and future needs of our students. Objectives are determined by the critical needs of our society. All students must learn to value mathematics, to reason mathematically, and to communicate mathematically; they must become problem solvers and become confident of their mathematical ability.

What students learn is fundamentally connected to how they learn it. Four major shifts in the classroom environment are needed to improve mathematics education for every child; a shift towards classrooms as mathematical communities; a shift towards logic, mathematical reasoning, and evidence as verification; as shift towards conjecturing, inventing, and problem solving; and a shift towards connecting mathematics, its ideas, and its applications.

Content features of the Mathematics Program are summarized below.

- Problem situations that establish the need for new ideas and motivate students should serve as the content for mathematics in the middle grades. In developing problem solving situations, the application of mathematics to real-world problems should be emphasized.

- The secondary curriculum should emphasize conceptual understandings, multiple representation of topics and connections among them and other areas of mathematical modeling, and mathematical problem solving. It should not be dominated by memorization of isolated facts and procedures.

- A broad range of topics must be taught to all students. Arithmetic computation will not be a direct object of study in the secondary school. Number sense and operation sense will be strengthened in the context of applications and problem solving. No student should be denied access to the study of mathematics because of lack of computational or symbol-manipulation skills.

- Communication with and about mathematics should permeate the school mathematics curriculum.

- Technology, including calculators, computers and videos should be integral components of the curriculum. These devices and formats free students from tedious computations and allow them to concentrate on problem solving and other important content.

Features of the mathematics curriculum:

1. The **mathematics curriculum** should be conceptually oriented. This allows children to acquire clear and stable concepts by constructing meanings in the context of physical situations. It also provides anchoring for the acquisition of skills and supports the development of problem solving.
2. A broad range of topics must be taught. Many of the topics that are new can help students recognize the need for arithmetic concepts and skills and provide new settings for their use. These topics should be taught as an integrated whole, not as isolated features. Mathematically literate students must know more than arithmetic: measurement, geometry, statistics, probability and algebra are important branches of mathematics.
3. The **mathematics** curriculum should actively involve children in doing mathematics. Learning by “telling” does not help children construct mathematical knowledge. An environment of active learning must permeate the classroom.
4. The **mathematics** curriculum should emphasize the development of children’s mathematical thinking and reasoning abilities. They must learn to think and communicate mathematically. Fluency in the language of mathematics and the development of number sense, spatial sense, and operation sense should be the cornerstones of the curriculum.

5. The **mathematics** curriculum should emphasize the application of mathematics. The major purpose of learning mathematics is to help children understand and interpret their world and solve problems that occur in it..
6. The **mathematics** curriculum should make appropriate and ongoing use of calculators and computers. Calculators enable children to explore number ideas and patterns, to develop concepts, to focus on problem solving, and to investigate realistic applications. They do not replace the need to learn basic facts, to compute mentally or to do **reasonable** pencil and paper computations. Calculators highlight the importance of teaching estimation to recognize the reasonableness of computed results.

Materials:

Classrooms should be equipped with the following:

1. Ample sets of manipulatives (spinners, cubes, tiles, geoboards, pattern blocks, scales, rulers, protractors, graph paper, base ten blocks, counters, fraction models, to name a few)
2. Resource materials to develop problems and ideas for explorations.(ideally, this involves accessibility to computers)
3. Calculators for each child with functions appropriate for the tasks being performed.

Instructional practices

- Learning should engage students both intellectually and physically. Students must become active learners. Mathematics students are particularly responsive to hands-on activities involving all of the senses. The use of concrete materials to develop concepts must take precedence over drilling on pencil and paper algorithms. Programs that involve limited developmental work, that emphasize symbol manipulation and computation rules, and that rely heavily on paper-and-pencil worksheets do not fit the natural learning patterns of children and do not contribute significantly to their mathematical development.

- Classroom activities should provide students with the opportunity to work individually and in groups. Students must be actively involved in conjecturing, exploring, analyzing and applying mathematics in both a mathematical and real-world context. The teacher should be a facilitator of knowledge rather than a dispenser of information. How well children come to understand mathematical ideas is far more important than how many skills they acquire.

- Students' cultural backgrounds should be integrated into the learning experiences. Teachers must also be sensitive to the fact that students bring very different everyday experiences into the classroom. This is why communication in mathematics is so important. Discussion of mathematics, questioning, justification of thinking, and writing about mathematics are important instructional practices that build beliefs about what mathematics is and what it means to know and do mathematics.

- Assessment in various forms is an integral part of instruction, not just to assign grades. Multiple means of assessment methods need to be used to evaluate what we value in the learning of mathematics. Single- answer pencil-and-paper tests are often inadequate to assess the development of students' abilities to analyze and solve problems, make connections, reason mathematically and communicate mathematically.