

Issues in the Mathematics Curriculum

Marlow Ediger
Northeast Missouri State University
Kirksville, Missouri

There are salient issues in the mathematics curriculum that need discussion and resolution. Each teacher and supervisor needs to take a position on these vital issues. Which ones are the most important? I have identified four issues for discussion: inductive vs. deductive teaching; active student involvement vs. passive reception; measurable vs. general objectives; and the learner-centred vs. the society-centred curriculum.

Inductive vs. Deductive Teaching

Students may learn significant concepts and generalizations through induction. In this method of teaching, students use discovery techniques to answer questions or solve problems. First, students identify a question or problem. Then the students secure, either individually or in groups, the necessary facts and concepts they will need to answer the question or solve the problem. From the information students have acquired, they develop broad generalizations. These generalizations, which are supported by facts, are used to answer the question or solve the problem.

The opposite of the inductive method of teaching is the deductive method. In the deductive method, the teacher explains a new process to students. Students then apply that new process to a question or problem. In this method, a "one-way street" of communication exists: from the teacher to the student. The students must attach meaning to the process being taught in order that the process can be used to answer a question or solve a problem.

Active Student Involvement vs. General Objectives

Teachers who emphasize active student involvement believe that students learn by doing. Thus, with guidance from the teacher, students identify and solve life-like mathematical problems. To become proficient in problem solving, a student needs to practise specific problem-solving skills. These include selecting a problem, gathering data or information, developing a hypothesis or providing a solution to the problem, testing the hypothesis, and, if necessary, revising the hypothesis. There is no rigid sequence of steps to solving a problem: the steps should be flexible.

In a teaching method in which the student is a passive receiver of information, which may be facts, concepts, or generalizations, no provision is made for the

needs of each student. Ideally, each student will apply to the problem the information gleaned from the teacher's explanation or lecture. In contrast, the active student involvement method of teaching, which has students solve problems relevant to everyday life, demands the participation of the whole person: his or her intellect, emotions, and social and physical skills. This method of teaching mathematics helps integrate school and society.

Advocates of active student involvement believe that: students are capable of and interested in making curricular decisions; students are better qualified than teachers to order the sequence of their studies; and students need to evaluate themselves in order that evaluation be effective, and in order that evaluation have an impact on the student.

Measurable vs. General Objectives

How precisely should objectives for student attainment be stated? When the teacher uses measurable objectives, the learning activities guide students to attain the objectives. Then, the teacher may measure to determine whether a pupil has achieved the stated goal. Successful students then attempt to attain the next sequential objective. Unsuccessful students may need to be taught in a different way in order that they may attain their objectives.

Some methods for teaching that are related to the use of measurable objectives in mathematics are Instructional Management Systems, mastery learning, criterion-referenced testing (CRT), and exit objectives. In each of these methods, precise measurable objectives are used for teaching. Advocates of measurable objectives believe that teachers need to state clearly their intent to students; vagueness and ambiguity are not evident in this method.

Another advantage of using measurable objectives rather than general objectives is that each experience selected is chosen on the basis of one criterion: do the activities guide students to attain specific objectives? If the activity is too complex or if it lacks challenge, it is omitted. The teacher may measure his or her own success in teaching by determining whether students have attained the objectives. Furthermore, the results of learner progress may be expressed clearly and precisely to parents. There should be evidence that students are or are not achieving their measurable objectives.

The alternative to using measurable objectives is to use broad general goals to provide some kind of direction in determining the kinds of information a student wishes to develop and to use evaluation procedures that lack precision in determining whether students have attained objectives.

Learner-Centred vs. Society-Centred Curriculum

Should most of the objectives in teaching and learning come from students themselves? Or, should goals for students be selected on the basis of what society needs and deems significant? How might ends be chosen that reflect personal interests and purposes of students?

First, students can decide which tasks to pursue and which to omit when interacting with learning centres in the school/class setting. An adequate number of

tasks needs to be in evidence at diverse learning centres in order for students to select, as well as omit, sequential experiences. Students may then select truly interesting tasks to pursue. It is hoped that students may perceive the purpose of and reasons for participating in ongoing activities.

Additional teaching strategies emphasizing personal interests and purposes of students include:

1. *Individual Reading.* Each pupil selects and reads a library book, pertaining to mathematics, which has interesting content and which is at the reading level of the student. The student may also choose how to be evaluated in terms of using appropriate word-recognition techniques and comprehension skills. Thus, the student may read a self-chosen selection to the teacher; the teacher might then assist the student to appraise the quality of the student's word-recognition techniques. To reveal comprehension, a student may develop a mural, diorama, model, or creative dramatics presentation to reveal what has been learned from the book.

2. *Contract System.* The student, with teacher guidance, may specify which activities to complete involving mathematics within a particular period of time. The contractual agreement should specify a reasonable amount of time in which the activities shall be completed. Also, the activities must reflect student enthusiasm and must have a purpose.

To emphasize societal needs in the mathematics curriculum, teachers and supervisors need to ascertain what things society believes students should learn. Among other things, these might include:

1. being able to compute the total cost of goods and/or services purchased in any situation.
2. possessing the skill to ascertain the amount of change required for a cash purchase of goods and/or services.
3. being skillful in writing cheques and in keeping a responsible chequebook balance.
4. knowing how to obtain loans to make satisfactory investments.
5. possessing knowledge of concepts involved in interest rates.
6. realizing specific abilities involved in ordering materials from mail-order companies.
7. shopping intelligently for necessary goods and services used in the home.
8. knowing how to buy insurance for property and health.
9. learning to live within a budget.
10. being able to complete job application forms as well as being knowledgeable about required taxation forms at the local, provincial, and federal levels.

Conclusion

Selected issues in the mathematics curriculum need study, analysis, and synthesis. Teachers and supervisors need to become students of philosophical issues in curriculum development. Each issue needs to be resolved in terms of guiding students to achieve the optimum level of achievement in the mathematical areas of their personal interests. Also, students need to understand the purpose and meaning of mathematics; this can be done by using mathematical problems that are relevant to the everyday lives of students.