

Mathematics in General Education

A Report of the Committee on the Function of Mathematics in General Education for the Commission on Secondary School Curriculum Progressive Education Association 1940

Why?

This report was commissioned in 1932 and published on the eve of World War II in 1940. Within the growing national concern over the threat to democracy, the status of mathematics in the secondary curriculum was being questioned. The economic and social changes during this time period seemed to call for a change in the purposes of secondary education. Most young people were excluded from employment because during the depression most businesses and industries employed fewer youth workers. This reduction in youth employment opportunities translated into an increase in secondary-school enrollments. The goal of the Progressive Education Association (PEA) committee was to examine “the study and teaching of mathematics for their value in relation to the whole process of general education” (p. vi). Among other concerns were a sharp decline in the number of students enrolling in mathematics courses and perceived loss of relevancy of mathematics in the secondary schools. The committee was also concerned with the communication gap between mathematics and other disciplines.

The purpose of general education is to provide rich and significant experiences in the major aspects of living, so directed as to promote the fullest possible realization of personal potentialities, and the most effective participation in a democratic society. (p. 43)

The report therefore attempts to identify the current aims and purposes of general education, to define the function of mathematics within general education, and to suggest appropriate content and methods of teaching mathematics.

Who?

The Committee on the Function of Mathematics in General Education consisted of eight members who were students of educational theory together with teachers of mathematics both on the secondary and college level.

- Albert A. Bennett, *Professor of Mathematics, Brown University*
- Cuthbert Daniel, *Editorial Consultant, Radio Research Project, Princeton University*
- Harold Fawcett, *Associate Director and Teacher of Mathematics, Ohio State University School*
- Maurice L. Hartung, *Assistant Professor of the Teaching of Mathematics, University of Chicago*

- Robert J. Havighurst, *Director for General Education, General Education Board*
- Joseph Jablonower, *Member Board of Examiners, New York City, and formerly Head of the Department of Mathematics, Fieldston School*
- Ruth Kotinsky, *Secretary of the Commission on Secondary School Curriculum, Progressive Education Association*
- V. T. Thayer, *Chairman of the Commission on Secondary School Curriculum, Progressive Education Association, and Educational Director of the Ethical Culture Schools*

Guiding Principles of the Committee

In response to the changing social and economic conditions, paired with revised theories of learning, the Progressive Education Association commissioned this report to address the role of mathematics in general education. There was a desperate need to address the vast increase of students with varying abilities attending secondary schools. Since the turn of the century, students attending secondary schools were preparing for skilled jobs or college. No longer were secondary students a homogenous group, they were diverse both in their intellectual abilities and vocational interests. In contrast to the influx of students in the secondary schools, there was a marked decrease in enrollment in mathematics courses. Furthermore, those students enrolling in these courses were failing at an alarming rate.

New learning theories of the time required teachers and curricula to view the child as a whole, both physically and emotionally. The secondary schools were being asked to be mindful of the student and his place in and responses to the world around him.

Overview of the Report

The 423-page report of the Committee on the Function of Mathematics in General Education was published in 1940. The report was divided into four sections.

- **Part I The Teaching of Mathematics in Relation to General Education**
Basic educational philosophy and role of the teacher
- **Part II Major Understandings Growing out of the Mathematical Experience**
The committee selected seven broad categories in mathematics, which it felt were extensively applicable to problem solving. These were:
 - *Formulation and Solution*
The teacher should help students analyze problems and determine appropriate methods to approach these problems. The problem situations may not lend themselves to mathematic solutions, but decisions with respect to determining appropriate methods would come from the mathematics.

- Data

The teacher must help students learn how to collect data and organize it in a way that will help them answer questions. They need to become familiar with differing kinds of data and their characteristics. The student should be able to collect and record data, understand the measurement process, and become familiar with the construction and use of tables and graphs.
- Approximation

The teacher must help students to analyze and interpret their data. Because measurement has limitations with instruments and observations, it is necessary to learn to approximate. A major emphasis was central tendency, correlation, and variation. Approximation was a new and difficult concept to include in the curriculum.
- Function

The teacher must help students make the connection between data and proper inferences that can be made. This relation is important because it helps make predictions, but also may reveal relationships that have not been thought about. The concept of function is one that is useful in many situations whether a student is going on to college or entering a technical occupation.
- Operations

The basic need of the operations is important to mathematics, but the committee felt that there was an overemphasis on drill and rote manipulations involving operations. It felt there needed to be a change toward more learning of concepts and less about the techniques of how you complete the operations involved.

“...if an operation is never needed again or is demanded only infrequently, it is clearly a questionable procedure to drill on it for the purpose of developing skill or for the sake of a highly problematical retention of the ability” (p. 183).
- Proof

The committee believed that the concept of proof had a great influence on thinking. The teacher must help the student to train the mind in logical thinking. Students need to acquire a thorough understanding of certain aspects of logical proof, which will encourage him to apply this understanding in a variety of life situations. The student should be able to use if-then statements, understand deduction and induction, distinguish between logical deduction, truth, and fact, and finally, that truth seeks validity rather than truth.
- Symbolism

The teacher needs to help the students study the use of symbols in mathematics and compare the uses of symbols in mathematics to the ordinary

language that is spoken. Students need to be aware of the wide usage of symbols and how our world uses symbols to communicate.

- **Part III The Development and Nature of Mathematics**
This section was designed to help students appreciate the development and nature of mathematics.
- **Part IV Understanding the Student and Evaluating His Growth**
This section focused on the student as a human being and evaluating growth of the student toward the objectives of general education.

The report was intended for administrators, curriculum experts, all teachers of mathematics at the secondary level, and teachers in training. The committee proposed that teachers change and improve curriculum using the report as a guide.

While the underlying foundation of the report was to define the role of general education in providing “*rich and significant experiences in the major aspects of living,*” more specifically, mathematics should assist students in becoming knowledgeable consumers, improve their ability to problem solve, familiarize students with persons, groups, and institutions that use mathematics, and increase the “mathematization” of all fields. The curriculum as a whole should consider all concepts cohesively, not in isolation. Finally, all applications should be diverse, yet applicable to more specific situations.

The underlying theme of the report paralleled the international political climate during the time period prior to World War II and reflected the urgency felt for the preservation of democracy. The committee desired that secondary schools produce students who could address real problems, value genuine solutions, collect and interpret data, not be deceived by inaccurate or misleading statistics, and recognize valid proof. It was believed that democracy allowed citizens to formulate problems, whereas a dictatorship did not. A democracy promoted the ability of people to think clearly about problems in a logical manner, and facilitate the free play of ideas promoting individualism. If these concepts were included in the general education curriculum it was believed democracy would persevere. Mathematics specifically should encourage the development of the following characteristics of democratic living:

- Social sensitivity
- Aesthetic appreciation
- Tolerance
- Cooperativeness
- Self-direction
- Creativeness
- Ability to use reflective thinking

Most importantly, the committee held the teacher responsible for promoting problem solving and reflective thinking in each student. Through problem solving, democracy would prevail. Additional recommendations from the report included the importance of students being

presented with concrete problems that are real to students and encouraging an investigative approach to the resolution of those problems. The committee also advocated classroom methods that foster an attitude of discovery and value creativity in problem solving.

Far Reaching Implications

- Teachers of mathematics have the responsibility to society to teach problem solving and students need to use this skill in all classes, as well as in life.
- All activities should enable students to resolve a problem situation where intelligent decision making is needed.
- *“If mathematics is to be a field for creative activity, the approach to problems must involve a type of investigational experience which is an adventure into the unknown—it must provide constant opportunity for discovery.”*
- One of the first reports to suggest such a strong link between mathematics as problem solving and the welfare of democracy as a societal institution.

Significance of the Report

The Progressive Education Association (PEA) report *Mathematics in General Education*, provided a summation of “*the major reform tendencies that had been affecting the course of mathematics curriculum over the previous half century.*” With a broad group of students entering the school system teachers needed new resources to deal with various levels of academic competency. One of the most significant aspects of this report was the recommended extension of the curriculum beyond arithmetic, algebra, and geometry to include approximation and data analysis. The report advocated the importance of focusing on problem solving and reflective thinking as ways to preserve democracy. Many of the recommendations of this report went unheeded as the country actually dealt with the global crisis of World War II.

Resources

- Committee on the Function of Mathematics in General Education of the Commission on the Secondary School Curriculum of the Progressive Education Association. (1940). *Mathematics in general education*. New York: D. Appleton-Century.
- Osborne, A. R., & Crosswhite, F. J. (1970). Forces and issues related to curriculum and instruction, 7-12. In P. Jones (Ed.), *A history of mathematics education in the United States and Canada* (pp. 225-234). Reston, VA: National Council of Teachers of Mathematics.