The Committee of Ten

Why?
The prevailing philosophy was that high schools were to prepare students for college. There was an alternative view that the high school curriculum should be broadened to serve all students. This situation resulted in many different subjects being taught. For example, a survey of secondary schools revealed that nearly 40 different subjects—13 of which were found in only a few schools—where being taught in these secondary schools, and the time allocated for these subjects varied greatly. This diversity of subjects and range of time allocated for them contributed to the growing dissatisfaction with the state of secondary education in the latter part of the 19th century.

What?
In response to this situation, the National Education Association appointed a committee on the problems of secondary schools. In 1892, this Committee of Ten was formed to select school and college teachers of certain subjects to consider the proper limits of each subject, the best methods of instruction, the most desirable allotment of time for the subject, and the best methods of testing the pupils' attainments.

Thus, the primary purpose in convening the Committee of Ten was to provide a national force for standardizing the secondary school curricula.

Who?
Members of the Committee of Ten

Charles W. Elliot, *President of Harvard University, Cambridge, MA,* **Chairman**
William T. Harris, *Commissioner of Education, Washington, DC*
James B. Angell, *President of the University of Michigan, Ann Arbor, MI*
John Tetlow, *Head Master of the Girls' High School, Boston, MA*
James M. Taylor, *President of Vassar College, Poughkeepsie, NY*
Oscar D. Robinson, *Principal of the High School, Albany, NY*
James H. Baker, *President of the University of Colorado, Boulder, CO*
Richard H. Jesse, *President of the University of Missouri, Columbia, MA*
James C. Mackenzie*, Head Master of the Lawrenceville School, Lawrenceville, NJ*
Henry C. King, *Professor in Oberlin College, Oberlin, OH.*

The Committee of Ten appointed a ten-member sub-committee for each of the following subjects: Latin; Greek; English; Other Modern Languages; Mathematics; Physics, Chemistry, and Astronomy; Natural History; History, Civil Government, and Political Economy; Geography.

Each sub-committee met independently and offered a report. Since each of them focused exclusively on their discipline, their focus was limited and did not consider the entire landscape of the secondary school. An examination of their report reveals that when the amount of time is totaled for all of the disciplines, it exceeded the length of the school day (See pp. 34-35 of the report). For example, in 11th grade Latin, Greek, and two other modern languages recommended that 5, 5, 4, and 4 periods per week—totaling 18 be allocated for development of these languages. This is a reflection of the value each sub-committee had for their discipline, i.e., they each felt their discipline was worthy of a significant time allotment in the school curriculum.

The summary of mathematics topics and time allocation by grade as proposed by the Mathematics Sub-Committee is shown. This provides an overall picture of the proposed elementary and secondary mathematics curriculum as envisioned by the Mathematics Sub-committee.

The members of the sub-committee participating in the Mathematics Conference were:
Prof. William E. Byerly, *Harvard University, Cambridge, MA*
Prof. Florian Cajori, *Colorado College, Colorado Springs, CO*
Prof. Henry B. Fine, *College of New Jersey, Princeton, NJ*
Prof. Simon Newcomb, *Johns Hopkins University, and Washington, DC*
Prof. George D. Olds, *Amherst College, Amherst, MA*
Prof. T. H. Safford, *Williams College, Williamstown, MA*

Arthur H. Cutler, *Principal of a Private School for Boys, New York City.*
W. A. Greeson, *Principal of the High School, Grand Rapids, MI*
Andrew Ingraham, *Swain Free School, New Bedford, MA*
James L. Paterson, *Lawrenceville School, Lawrenceville, NJ*

What was produced?
The Mathematics Sub-Committee met for three days in December 1892 at Harvard University and issued five reports addressing the mathematics curriculum:
I. General statement of conclusions
2. Special report on the teaching of arithmetic
3. Special report on the teaching of concrete geometry
4. Special report on the teaching of algebra
5. Special report on the teaching of formal geometry

Here are some recommendations from these reports:
General statement of conclusions
(1-a) Textbooks should be subordinate to the teacher. Textbook problems and illustrations should be drawn from familiar objects.

(1-b) Teaching should "exercise the pupil's mental activity" and "rules should be derived inductively instead of being stated dogmatically" thus rules should follow rather than begin a topic.

(1-c) Topics should be examined with the idea of eliminating or giving less attention to some (e.g., cube root) and more attention to others (e.g., weights and measures that students actually use).

(1-d) High school mathematics courses should have the same expectations for all students.

(1-e) Better preparation of high school teachers is needed to implement the proposed changes.

Special report on arithmetic

(2-a) A radical change in the teaching of arithmetic was needed. It should be "abridged by omitting entirely those subjects which perplex and exhaust the pupil without affording any really valuable mental discipline, and enriched with a greater number of exercises in simple calculation, and in the solution of concrete problems." This represented a blow to the prevailing psychology of the time, namely faculty psychology—the mind is a muscle. This statement makes it clear that arithmetic should not be viewed as the muscle builder.

(2-b) The arithmetic curriculum should be mapped out and completed by the end of grammar school, about the age of 13, with "attention given to facility and correctness of work".

(2-c) Some topics should be curtailed or omitted, including the greater part of commercial arithmetic and examples "not intelligible to the pupil should be omitted".

(2-d) The study of arithmetic should be intimately associated with the study of algebra, of concrete geometry, and of elementary physics. Note—an early example of integrating mathematical topics.

(2-e) Examples and exercises should reflect the environment of teacher and students.

Special report on concrete geometry

(3-a) At about age 10, one hour per week should be devoted to systematic instruction of concrete or experimental geometry for at least three years.

(3-b) The focus should be on concrete and not on logical deduction. Properties of figures and solids should not be proved but be illustrated by "cutting up and re-arranging drawings or models."

(3-c) Students should learn to estimate by the eye and then measure accurately the lengths of lines, areas of simple figures, magnitudes of angles and make maps to scale. Note—this attention to estimating before engaging in measuring.

(3-d) Students should be convinced of the truth of their propositions by "abundant concrete illustrations and by frequent experimental tests".

(3-e) Students should express themselves verbally, and the "language employed should be, as far as possible, the language of the science, and not a temporary phraseology to be unlearned later."

Special report on algebra

(4-a) The study of systematic algebra should begin at the age of 14, but in connection with the study of arithmetic, the students should earlier be made familiar with algebraic expressions and symbols, including the method of solving simple equations. For example, "If a square table is a feet long, what is its area?"

(4-b) Algebra should be studied about 5 hours per week during the first year and an average of 2.5 hours per week for the next two years. Note—the forerunner of the algebra-geometry-algebra sequence that continues to be reflected in many high schools.

(4-c) Oral exercises in algebra (similar to mental arithmetic) are recommended. Quickness and accuracy in both oral and written work should be the goal.

(4-d) Students should demonstrate mastery through quadratic equations and equations of quadratic form.

(4-e) Give more attention to radicals and exponents (both fractional and negative), but exclude progressions, series, and logarithms. Note—the report stated that familiarity with logarithmic tables is desirable for future study in technical courses, and this topic would be addressed in the study of a separate course in trigonometry.

(4-f) Certain skills, such as the rule of signs are complex and challenging for students to understand. In such cases, the "proof should be at first omitted and addressed later"—perhaps in college. However, students must be convinced of their truth by illustration or induction.

Special report on demonstrative geometry

(5-a) The study of demonstrative geometry should begin at the end of the first year of algebra, and be done with algebra for the next two years.

(5-b) Axioms and postulates are vital in geometric development and they should be correctly understood.

(5-c) Demonstrative Geometry is the most elaborate illustration of the mechanism of formal logic in the entire curriculum. Understanding and using these elementary principles of logic should be done early in geometry.

(5-d) The elegance and completeness in geometrical demonstration is very important. An abundance of oral exercises is recommended, and all demonstrations which are not exact and formally perfect should be rejected.

(5-e) Students should not just engage in geometric demonstrations from the textbook. Independent work in geometry is rewarding and should be encouraged as a means of stimulating creative talent in mathematics. "There is no student whom it will not brighten and strengthen intellectually as few other subjects can."

(5-f) Both plane and solid geometry should be studied in preparation for college.

(5-g) Modern synthetic or projective geometry should have a place in secondary school or college. This subject has been "generally ignored. . . it possesses the concreteness of the ancient geometry without the tedious particularity, and the power of analytical geometry without the reckoning and by the beauty of its ideas and methods illustrates the esthetic quality which is the charm of the higher mathematics."

Significance of the Committee of Ten

Based on an examination of later documents, the report from the Committee of Ten helped influence and shape a number of changes in secondary school. Here are some of them:

Reshaped the high school course offerings by proposing alternatives to the classic curriculum and put forth the notion that high schools should help prepare all students to do well in life.

Recommended a 8-4 organization for elementary and secondary schools.

Stimulated thoughtful discussion of the mathematics curriculum as it recommended deletion of some topics and more attention to others.

Opened the way for subsequent modifications of the theory of mental discipline. More specifically, it did not associate the development of mental powers with any particular subject.

Provided an orientation of instruction (e.g., concrete geometry, and rules should follow rather than precede a topic) that paved the way for learning that reflected an activist orientation.

Although directed toward high schools, the report had direct relevance to the elementary school.

Called for more highly trained teachers to introduce the recommended changes in both elementary and secondary school.

The recommendations of the Committee of Ten were forward looking. Their report opened the way for subsequent modifications of the theory of mental discipline. It's placement of geometry into elementary grades was revolutionary to an elementary program that was focused exclusively on arithmetic. It suggested a high school algebra-geometry-algebra sequence that has remained in schools in the United States for many years.

The reactions to the report were generally positive. Most commentary on education during the remainder of the 18790 decade and early part of the 20th century alluded to the report. Many mathematics textbooks published during the next 20 years cited the Committee of Ten in their preface and purported to reflect their recommendations.

National Education Association (1894). Report of the committee of ten on secondary school studies with the reports of the conferences arranged by the committee, New York: American Book Company.

 Jones, Phillip S. (1970). A history of mathematics education in the United States and Canada, Reston, VA: National Council of Teachers of Mathematics.