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A Study of Secondary Mathematics: Reports Impacting Curriculum

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A STUDY OF SECONDARY MATHEMATICS: REPORTS IMPACTING CURRICULUM

A RESEARCH PROJECT IS PRESENTED TO THE
FACULTY OF THE COLLEGE OF EDUCATION
DEPARTMENT OF CURRICULUM AND INSTRUCTION
OLD DOMINION UNIVERSITY

IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE
DEGREE OF MASTERS OF SCIENCE IN
SECONDARY EDUCATION

BY
PHILIP B. NELSON
AUGUST 1998

APPROVAL PAGE

This research paper was prepared by Philip B. Nelson under the direction of Dr. John Ritz in OTED 636, Problems in Education. It was submitted to the Graduate Program Director as partial fulfillment of the requirements for the Degree of Master of Science in Secondary Education.

APPROVAL BY: John M. Ritz

Dr. John Ritz
Advisor and Graduate
Program Director

8-12-98
Date

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CHAPTER ONE

INTRODUCTION

The United States education system in general, and mathematics education in particular, is constantly a major topic on the public agenda. There has been a veritable revolution in secondary mathematics curricula since the 1950's, but the roots of this movement are circa 1900 when the first committees or commissions were tasked to study and document findings. This early criticism, while noteworthy, was not focused nor championed by any professional organization until the 1950's when political (the cold war), social (racial discrimination) and technological (Sputnik) factors combined to force a concerted effort. "Responding to frequent exhortations, an avalanche of foundation and government reports described the emerging national consensus that only dramatic mathematics curriculum reform would ensure international norms and societal needs were achieved" (Campbell and Grinstein, 1988, p. XIII).

Several themes in the commentaries on mathematics education can be traced throughout the history of mathematics in the 20th century:

- A changing society requires a different mathematics curriculum.

- The ubiquitous role of technology alters priorities.
- Advances in the process of learning reveal more effective tracking methods.
- Few women and minorities complete the mathematics pipeline.
- Worldwide markets compel the American work force to be educated in mathematics(Campbell and Grinstein, 1988).

Yet, for many decades the United States maintained a rather fixed mathematics curriculum at the elementary and high school levels (Kline, 1973, preface). Radical reform to curriculum development was infrequent due to the existence of clear barriers to change. However, as previously mentioned, forces came together in the late 1950's from various quarters to exert a mixture of pressures prompting innovation. The overriding problem of curriculum development "is to ensure that a response is made to all the relevant pressures, and attempts made to surmount all the barriers (Howson, Keitel, Kilpatrick, 1981, p. 3).

Statement of the Problem

The problem of this study is to review the impact of commissions and committee reports on secondary mathematics curricula in the 20th century. This study makes a historical review of numerous reports written, circulated and advocated

throughout this century by various organizations associated with diverse reform goals. Each of these reports influenced the development of secondary mathematics curriculum to some degree but only five became institutionalized as "landmark" reports.

Research Goals

Secondary mathematics curriculum development reforms try to answer common questions and to provide "statement of goals" for achieving excellence. The research goals of this study include:

- What influence did societal pressures of the time have toward the reports recommended curriculum?
- What influences did technological developments of the time have toward the reports recommended curriculum?
- What were or are unique (if any) mechanisms of the time that initiated the perceived need for reform in mathematics education?
- What influence did changing college entrance requirements of the time have towards the reports recommended curriculum?
- What curricula was recommended to ensure student study achieved the desired performance in mathematics?

Background and Significance

Toward the close of the nineteenth century a national system of education was clearly evolving in this country, as society increased its demand for a ladder of formal schooling from grade school through the university (Sizer, 1964, p. XII). This period was recognized as a time when American secondary schooling was not clearly defined.

Commissions and committees were organized to research and report on the scope and content of secondary mathematics education in the United States. In fact, some of the most persistently influential formulations of goals in secondary education were published as long ago as the 1890's (Krulick and Weise, 1975, p. 10). Continuous throughout the 20th century, secondary mathematics curriculum development has itself developed; "moving from small beginnings to the prosperity of an academic, even scientific, reputation. In so doing, ideas, orientations and approaches have been changed"(Howson, Keitel, Kilpatrick, 1981, p. 239).

Limitations of the Study

Methodological limitations of this study include:

- Data collection involved review of books, journal articles, previous studies or projects, professional organizations and U.S. Government and States Department of Education material.

- Interpretation of source material was subjective.
- No sampling or unique instrument was developed and distributed for data collection and analysis.

Assumptions of the Study

The complex and fundamental reforms advocated by reformers are not easy to establish, but they are appropriate and worthy of pursuit (Ronald D. Anderson, Study of Curriculum Reform).

- The reform process takes years to develop.
- Recognizing that reform will hang in the balance for a long time, a critical breakdown in some aspect of the systemic support system that sustains the reform could result in their abandonment at any point over the extended period of time (Ronald D. Anderson, Study of Curriculum Reform).
- Reform is an ongoing process.
- Some reports had more influence on secondary mathematics curriculum reform than others. These reports are identified as "landmark" reports because of their overall impact to secondary mathematics curriculum reform efforts.

Procedures

The following procedures were used to collect pertinent

information and data:

- The Internet was used to access the abundance of education reform groups, past and current projects/studies, bibliographies and literature.
- Books, journal articles and identified reports of noteworthy studies were researched for historical information and data.
- Analyzed data generated and published by professional organizations such as the National Education Association (NEA), College Entrance Examination Board (CEEB), Mathematics Association of America (MAA), National Council of Teachers of Mathematics (NCTM) and National Research Council (NRC) were instrumental in establishing standards and develop curriculum in secondary mathematics. This analysis attempted to validate or repudiate original suppositions and recommendations based on these data.

Definition of Terms

The mathematics reform movement has produced unique terms and phrases that are defined as follows:

- Curriculum - an established series of courses of study that encompasses aims, content, methods and assessment procedures (Howson, Keitel, Kilpatrick, 1981, p. 2).

- Committee/commission - a group of people officially appointed to consider, investigate and report on a specific study.
- Mathematics reform - the movement aimed at identifying and correcting faults by introducing 'better' curricula in secondary mathematics education.
- Standards of Learning - level of excellence expected of secondary mathematics student(s).
- Tracking - a system in education where students are placed in specific groups or level of competency based on test performance and kept there through each grade.

Overview of Chapters

Mathematics today is continually being created and adapted to meet new needs. Curriculum content including topics formally reserved for college level courses are being introduced in the secondary school. New approaches to teaching these topics have been developed or are being researched. "Although pressure for change is high, little consensus exists on what mathematics students ought to learn now, much less what they need in the future. Lack of a national focus has created such disparities among standards that it is difficult to discuss curricula in meaningful and productive context" (Everybody Counts, 1989, p. 89). This

research study is an attempt to bring some focus on the reform movements drive to gain national acceptance to initiatives.

Chapter II will involve a review of literature developed and attributed to various periods of time since the 1890's. These five timeframes, (1)1890-1920, (2)1920-1940, (3)1940-1960, (4)1960-1980, and (5)1980-present, were chosen to highlight the report(s) that permeated the period and identify any "landmark" reports that strongly influenced curriculum development.

Chapter III will detail the extent of the review of literature by listing various books, journal articles, studies and reports populating each timeframe, the significant events that proved to be the external and internal variables perpetuating reform and the rather straight forward method(s) of data collection.

Chapter IV compiles the curriculum development activity by various commissions and committees during each timeframe.

Chapter V will summarize the findings from each period reviewed in Chapter IV, and make some recommendations.

Appendice A looks at a few of the professionals whose writings fostered the curriculum development field.

CHAPTER II

REVIEW OF LITERATURE

The impetus for change in the mathematics curriculum usually is rooted in pressures brought on by society, politics, educational theorists, college requirements, the mathematics community or new technological advances (Campbell and Grinstein, 1988, p. 45). "Seen in an archaeological sense, curriculum in any period can be an invaluable relic of the forms of knowledge, social values, and beliefs that have achieved a special status in a given time and place (Jackson, 1992, p. 157). "A traditional but often criticized facet of curriculum history is the attention that has been lavished on such artifacts of curriculum as committee reports. It has been argued that attention to what this or that committee had to say on curriculum matters is hardly relevant to the curriculum as experienced in schools" (Jackson, 1992, p. 162). Yet, "the question of whether given recommendations were translated into practice may not even be the most important question one may raise about those reports. They may signal the waning or the arrival of certain particular fashions in curriculum or even be a portent of what is to come (Jackson, 1992, p. 162).

Historical trends and demographic data confirm the importance of mathematics departments to offer effective, broad-based curricula. The focus of secondary school curriculum has, overtime, remained a transition from concrete to conceptual mathematics. Yet, the history of curriculum development in the United States, with our traditional and legal decentralization of education, shows that free-standing, full-service projects adopted intact did not take root, that a superficial district-by-district approach was untenable at best and that any curriculum reform development requires an extensive public information campaign (Everybody Counts, 1989, pp. 79-80).

1890-1920

The church's domination of education lasted for centuries and led to the establishment of two types of schools; the 'Latin' grammar school sponsored by the Church and humbler schools emphasizing the vernacular. The Latin school slowly succumbed to the academy; "the first American education institution not patterned on the European model" (Zais, 1976, p. 30). Typically, the academy was a private boarding school which attempted to combine in a single institution the values

and content of the Latin schools' classical curriculum with the values and content of the English schools' practical curriculum (Zais, 1976 p. 30). The humbler schools or "English High School", was intended to provide education beyond the elementary level at public expense for the children of those parents who could not afford the tuition of the academy (Zais, 1976, p. 40). Early on the curriculum of the high schools followed that of the academies but by the end of the Civil War, the curricula in the 300 plus public high schools was becoming increasingly differentiated from those of the academy (Zais 1976, p. 40). Alternative religious reform views, 'progressive' technology, commercial and business life associated with city dwelling and scientific revelations (Darwinism) all advanced the idea of education for the masses. It was during the latter years of the nineteenth century that responsibility for education made a significant shift from the Church to the State. Once education became a governmental interest it began to be accepted as a national asset to ensure an educated populace and an investment in the nation (Howson, Keitel, Kilpatrick, 1981, pp. 17-21). However, there was not a clear, concise transition from the private academies,

already established in America to address the educational needs of future merchants, industrialists, navigators or technologically skilled military officers to the idea of education for the masses. The public secondary schools were in a chaotic state and were unable to compete. Around 1890 a new era opened which was concerned with the change of the high school, and even the college, into continuations of the elementary schools. As the number of high schools increased, standardization differed immensely from one region to another. General dissatisfaction grew, and in 1890 the National Council on Education, part of the NEA, appointed a committee to investigate the problem of secondary schooling (Krulik and Weise, 1975, p. 60). This committee, *The Committee of Ten*, was assembled to make order out of the widespread chaos in secondary education; it provided a system, if not a long lasting one, at least the first, most difficult standardization (Howson, Keitel, Kilpatrick, 1981, p. XI). It was the specific function of *The Committee of Ten* to bring about curriculum reforms and to examine college entrance requirements (Sizer, 1964, p. 55). The *1893 Report of the Committee of Ten* indeed had profound effects, of two kinds: it influenced school courses

and exerted broad influence on school policy and thinking by educators (Sizer, 1964, p. 183). The curriculum recommended by *The Committee of Ten* was the first widely accepted by secondary schools and led to the establishment of a *Committee on College Entrance Requirements*.

The year 1918 is often regarded as the birth date of the curriculum field. It produced J. Franklin Bobbitt's first major book on curriculum, *The Curriculum*, and *The Cardinal Principles of Secondary Education* by the Commission on the Reorganization of Secondary Education of the National Education Association (Willis, Schubert, Bullough, Kridel, and Holton, 1993, p. 153). The committee defined the basis for curriculum development by stating, "Secondary education should be determined by the needs of the society to be served, the character of the individuals to be educated, and the knowledge of educational theory and practices available" (Tanner and Tanner, 1995, p. 95). The commission went on to create a statement of principles intended to broaden the curriculum to encompass virtually all of life's experiences, not merely academic subjects (Willis, Schubert, Bullough,

Kridel, and Holton, 1993, p. 153). The seven principle objectives - *The Cardinal Principles* - of education address: health, command of fundamental processes (reading, writing, arithmetic, and oral and written expression), worthy home membership, vocation, citizenship, worthy use of leisure, and ethical character (Tanner and Tanner, 1995, p. 95).

With the responsibility of education shifting from the Church to the State, the establishment of professional education associations and their willingness to finance the commissioning of committees to study the chaos present in the public school system, the American education profession was becoming institutionalized. Curriculum specialists consider the *Committee of Ten Report of 1893* and *The Cardinal Principles of Secondary Education* to be "landmark" curriculum development studies.

1920-1940

The Reorganization of Mathematics in Secondary Education, the "landmark" report of this period, was published in 1923 by the Mathematical Association of America (MAA). The MAA organized the National Committee on Mathematics Requirements in 1916 to

"undertake a comprehensive study of the problem involved in the improvement of mathematics education and to cover the field of secondary and college mathematics" (Krulik and Weise, 1975, p. 64). This report "formulated the aims of mathematical instruction into three general classes: practical, disciplinary, and cultural" (Kinney and Purdy, 1952, p. 23). It emphasized the purpose of mathematics in secondary education, stressed the importance of the transfer of learning, recognized the function concept, stated content requirements for mathematics courses that were used by the CEEB and finally included model curricula. An interesting observation made by the *1923 Report* was that the United States was at the time behind Europe in specific and professional training of secondary teachers.

This period also saw the foundation of the Progressive Education Association (PEA) that eventually boasted some of the most influential educators of the time. John Dewey, a progressive, was considered the definitive American educational philosopher of his day. "His key ideas including developing critical thinking, whole child development and relating knowledge to experience formed an educational infrastructure that

was uniquely American" (Berube, 1994, p. 43).

Societal changes wrought by the Great Depression slowed the study and development of secondary mathematics education curriculum reforms through most of this period. It was not until the military in World War II began studying the education needs of the Armed Forces and that war was brought to a close that significant reforms were again being proposed.

1940-1960

The Commission on Post-War Plans was created by the National Council of Teachers of Mathematics (NCTM) and issued three reports. The first, May 1944, delineated three "tracks" for various students to follow through their secondary educational years. These tracks were college-bound, vocational and the slow learner. It was exactly these three tracks that were offered to students in Ohio school districts from 1968-1972. The second, May 1945, listed thirty-three theses for improving 1-12th grades and 2-year junior colleges. The third report, July 1947, contained a check list of twenty-nine key concepts which defined functional competency for the junior high school

(Krulik and Weise, 1975, p. 72).

The School Mathematics Study Group (SMSG), the best known and largest project on mathematics curriculum, was organized in 1958 by mathematicians. Supported by the National Science Foundation (NSF), this groups initial emphasis was on changing the secondary curriculum to better serve the modernization of college introductory courses and enrich them with more demanding mathematical content (Howson, Keitel, Kilpatrick, 1981, p. 133). Three objectives of the SMSG were summarized in a program report published in March 1959: (1) an improved curriculum that offers students a deeper understanding of the basic concepts and structure of mathematics, (2) attract and train more students capable of studying mathematics with profit and (3) provide for extensive pre-service teacher training (Krulik and Weise, 1975, p. 80). It implicitly employed the research-develop-dissemination (RDD) model characteristics to quickly get its 'modern' mathematics materials accepted. The SMSG was considered 'successful' by the fact that its program was translated into 15 languages. Its influence provided a stimulus and model to innovators throughout the world, served to train textbook authors and initiated

commercialized texts. These initial efforts culminated in 1962 with the SMSG inaugurating a five year study called the National Longitudinal Study of Mathematical Ability (NLSMA).

1960-1980

The SMSG and the CEEB with its 1959 report, *The Program for College Preparatory Mathematics*, developed programs that incorporated common core content with unique recommendations of specific topics at different grade levels. These two programs were instrumental in establishing elements of more radical curriculum reform beginning in the 1960's. The SMSG and CEEB showed a tendency for previously accepted college-level mathematics curricula to migrate down to the secondary school level - a trend identified as 'modern' or 'new' mathematics.

Spawned by the SMSG and CEEB, newer and more radical groups began developing 'modern' mathematical concepts. Three reports by the *Committee on the Undergraduate Program in Mathematics (CUPM)* in 1961, 1964 and 1966 specified five levels of teaching responsibility. Levels II, III and IV delineated increasing teacher qualifications and subject content.

The realization that 'modern' mathematics required extensive in-service training of teachers was beginning to be recognized.

With the support of the NSF, a conference of 25 mathematicians was held in 1963 at Cambridge, Massachusetts. This conference produced *The Cambridge Report* which stated its purpose to present "tentative views upon the shape and content of pre-college mathematics curriculum". "The grand goal proposed by *The Cambridge Report* was to compress the mathematical program so that what was now taught over twelve years of school plus three of college would be completed by the end of high school; that is, in twelve years" (Aichele and Reys, 1971, p. 50). To attain this goal obsolete topics, such as numerical solution of triangles, were to be eliminated. "Drill for drill's sake would be abandoned and replaced by problems which illustrated 'new' mathematical concepts"(Krulik and Weise, 1975, p.87). The 'discovery' approach to pedagogy was advocated as invaluable for developing creative and independent thinking by the individual. Examination and critic of the purpose and recommendations in *The Cambridge Report* centered on the students ability to comprehend such advanced

mathematical concepts. *The Cambridge Report's* curriculum proposals were not widely accepted or implemented. The absence of explanatory and justifying material was interpreted to mean the advocates of 'modern' mathematics were not too clear themselves on where they were headed (Kline, 1973, p. 21).

In 1974 the *National Advisory Committee on Mathematics Education (NACOME)* was appointed to review and analyze school-level mathematics education. *The NACOME Report* was a conscious attempt by the mathematics education profession to address the growing resistance to 'modern' mathematics being advocated by the 'back-to-basics' movement (Campbell and Grinstein, 1988, p. 6).

This period saw an unprecedented proliferation of 'modern' mathematics programs with diverse theories. 'Modern' mathematics advocates wanted to make mathematics exciting by emphasizing the why of problem solving vice the how. Memorization, drills and rote learning were replaced by the discovery method and deductive logic approaches (Schiller, 1974, p. 20) To the 'average' student, however, 'modern' mathematics appeared enormously imposing and detrimental to

achievement.

1980 - PRESENT

Entering into the 1980's, in the heated debates and discussions over the condition of the American school system, there was general agreement that something had gone wrong. The United States was losing its pre-eminence as a world economic, social, political and military power. Comprehensive looks at what was wrong with our schools became pervasive and self flagellation became the norm. We institutionalized the process of education reform. It did not take long before how-to techniques for re-tooling the American education system were proposed and promoted using information warfare.

In 1980 the NCTM published *An Agenda for Action: Recommendations for School Mathematics in the 1980's*. Realistic and responsible curricula revision recommendations were written to advise society of the direction of mathematics education during the 1980's (Campbell and Grinstein, 1988, p. 7). Following closely on *An Agenda for Action* the NCTM released *Priorities in School Mathematics; An Executive Summary* that detailed the results of a national survey

completed under the PRISM project. This report was a compilation of answers from parents, administrators and teachers to questionnaires related to the NCTM's *An Agenda for Action* report.

A Nation at Risk: The Imperative for Education Reform was published by the National Commission on Excellence in Education in 1983. This extensive document provided a turning point by causing "the greatest debate about education in a generation". "The commission concluded that poor schooling was what put the nation at risk economically and socially, and that rigorous standards were necessary to alleviate the problem" (Willis, Schubert, Bullough, Kridel, and Holton, 1993, p. 401). A controversial report, *A Nation at Risk* painted a bleak American decline in the global industrial market place attributable to poor public education. "Not until the closing pages of the report was it acknowledged that American schools have been a major vehicle for social and educational opportunity, that the proportion of the American college-age population enrolled in college far exceeds that of other industrial nations, and that international test-scoring comparisons had revealed

that when matched against the best of the nations, U.S. students do indeed compare favorably" (Tanner and Tanner, 1995, p. 455). What *A Nation at Risk* did was to bring many different persons and groups together to assess the conditions of education and, if necessary, to propose changes (AASA, 1985, p. 5).

In 1991 President George Bush announced a 'revolutionary' transformation of schools program entitled, *America 2000: An Education Strategy*. At the Education Summit convened two years earlier, the nations governors adopted six national education goals with the pledge that the goals would be met by the year 2000 (Tanner and Tanner, 1995, p. 467). The six national education goals to be attained were: (1) all children will start school ready to learn, (2) 90 percent graduation rate from secondary schools, (3) competency will be demonstrated in five core subjects at the fourth, eighth and twelfth grade levels, (4) U.S. students will be first in the world in science and mathematics, (5) every adult will be literate, and (6) every school free of drugs and violence (Tanner and Tanner, 1995 p. 468). While these are the overarching national goals of *America 2000*, the underlying concepts in the program include choice/vouchers, higher

standards, radical reform, and national testing. What sets *America 2000* apart is that this is the first serious policy initiative in the nations history to address the federal role in education (Doyle, Denis P., Phi Delta Kappan, Nov. 1991). As governor of Arkansas, Bill Clinton played a significant role at the Education Summit and almost immediately upon becoming President, endorsed under the rubric *Goals 2000*, virtually all of the elements in *America 2000*, except for school choice/vouchers. To many educators "*America 2000* is vigorous, optimistic, and upbeat" (Doyle, Phi Delta Kappan , Nov. 1991). To others, *America/Goals 2000* needed a reformulation of priorities, was a continuum of crisis rhetoric, and lacked political and educational leadership commitment (Tanner and Tanner, 1995, p. 470).

A Nation at Risk jolted the nation into a frenzy of education reform movements while *America/Goals 2000* was the first serious attempt to address the federal governments role in education. Both these reports can be considered "landmark" studies because of the significant national education efforts following their publication.

Summary

The wake-up call for the 1980's and beyond can be traced to the publication of NCTM's *An Agenda for Action* (1980), Excellence in Education's *A Nation at Risk* (1983), and the Education summit's *America/Goals 2000* (1991). These three reports shocked and then galvanized the American education system, professional organizations, state school boards, business and government agencies into a massive reform effort. Mathematics today is continually being created and adapted to meet new needs. Several factors - growth of technology, increased applications, impact of computers and mathematics expansion have combined to greatly expand the scope of mathematics sciences. Curriculum content including topics formally reserved for college level are being introduced in the secondary school while secondary topics are migrating into the elementary programs. New approaches to teaching these topics have been or are being researched.

Curriculum development in the United States is a slow process fraught with hidden agendas and special interest groups. Curriculum implementation must overcome the inertia of the "status quo" in order to gain national acceptance. "The United States education

enterprise is in a state of turmoil, partly because of social pressures and partly because of dissatisfaction with past practices and past curriculum" (Krulik and Weise, 1975, p. 7). Written 23 years ago about the education proceedings of the 20th century to that point, it is still valid today. One major difference is curriculum reform has become 'big' business!

CHAPTER III

METHODS AND PROCEDURES

The population of books, journals and studies pertaining to secondary mathematics curriculum development are listed in this chapter. This is followed by a disconcertingly large number of external and internal variables that influence curriculum development. Information collection methods are briefly discussed followed by a summation of curriculum development in secondary education over the past century.

Population

1890-1940

1. BOOKS -*Readings in Secondary School Mathematics* (1911), The New *Education* (1915), and *The Curriculum* (1918).
2. JOURNALS - *Mathematics Teacher* (Vol. 4, Sept. 1911; Vol. 17, Jan. 1924; and Vol. 22, Mar. 1929).
3. STUDIES - *Report of the Committee of Ten* (1893), *The Cardinal Principles of Secondary Education* (1918), and *The Reorganization of Mathematics in Secondary Education* (1923).

1940-1960

1. BOOKS - *The Place of Mathematics in General Education* (1940), *Basic Principles of Curriculum and Instruction* (1949), *The College Board; Its First Fifty Years* (1950), and *Teaching Mathematics in the Secondary School* (1952).
2. JOURNALS - *Mathematics Teacher* (Vol. 4, May 1945; Vol. 41, Feb. 1948).
3. STUDIES - *Report of the Committee on Essential Mathematics for Minimum Army and Navy Needs* (1943), *First Report of the Commission on Post-War Plans* (1944), *Second Report of the Commission on Post-War Plans* (1945), and *Schools Mathematics Study Group* (1958).

1960-1980

1. BOOKS - *Curriculum Crossroads* (1962), *Secondary School Curriculum* (1963), *Secondary Schools at the Turn of the Century* (1964), *Secondary School Mathematics* (1965), *Reading in the History of Mathematics Education* (1970), *Confronting Curriculum Reform* (1971), *Why Johnny Can't Read: The Failure of the New Math* (1973), *Teaching Secondary School Mathematics* (1975), and *Curriculum; Principles and Foundations* (1976).

2. JOURNALS - *Mathematics Teacher* (Vol. 56, Nov. 1963; Vol. 57, Mar. 1964; Vol. 56 Mar. 1965).

3. STUDIES - *New Thinking in School Mathematics*: Organization for European Economic Co-operation (1961), *Committee on the Undergraduate Program in Mathematics Reports* (1961, 1964 and 1966), *National Longitudinal Study of Mathematics Ability* (1962), *Comparative Study of SMSG and Traditional Mathematics Material* (1963), *The Cambridge Report* (1963), *Overview and Analysis of School Mathematics: Grades K-12, The NACOME Report* (1975), and *Results and Implications of the NAEP Mathematics Assessment: Secondary School* (1975).

1980-Present

1. BOOKS - *Curriculum Development in Mathematics* (1981), *Computers in Mathematics Education* (1984), *Mathematics Education in Secondary Schools and Two-Year Colleges* (1988), *Curriculum; An Introduction to the Field* (1988), *New Directions in Mathematics Education* (1989), *Educating America* (1989), *Curriculum Development; A Guide to Practice* (1989), *Curriculum Differentiation* (1990), *Professional Standards for Teaching Mathematics* (1991), *Discrete Mathematics Across the Curriculum K-12* (1991),

Breaking the Barriers (1992), *Handbook of Research on Curriculum* (1992), *The American Curriculum; A Documented History* (1993), *American School Reform: Progressive, Equity and Excellence Movements, 1893-1993* (1994), and *Curriculum Development; Theory Into Practice* (1995).

2. JOURNALS - *Mathematics Teacher* (Dec. 1983; May 1984; Sep. 1984; Nov 1984; May 1985; Oct 1990), *Phi Delta Kappan* (Mar. 1990; Nov. 1991; Apr. 1993), *U.S. News & World Report* (Apr. 1998), *The Virginia Pilot* (Mar. and Apr. 1998).
3. STUDIES - *An Agenda for Action: Recommendations for School Mathematics of the 1980's* (1980), *Priorities in School Mathematics; An Executive Summary* (1980), *A Nation at Risk: The Imperative for Education Reform* (1983), *Results of the Third NAEP Mathematics Assessment: Secondary School* (1983), *American Association of School Administrators, Critical Issues Report* (1985), *Everybody Counts: A Report to the Nation on the Future of Mathematics Education* (1989), *Virginia International Mathematics Assessment Project* (1989), *Renewing U.S. Mathematics: A Plan for the 1990's* (1990), *America 2000: An Education Strategy* (1991), *A Study of the*

Participation and Achievement of Black, Hispanic and Female students in Mathematics, Science and Advanced Technologies in Virginia Secondary Schools (1992), *Study of Curriculum Reform* (1996), *Math and Science Scores: What Can be Done* (1998), and *In Battle of Education, Reform has Yet to Help* (1998).

Research Variables

Schools do not exist in a vacuum. The character of the culture that provides their context influences to an extremely high degree the nature and organization of curriculum content and objectives (Zais, 1976, pg. 156). This section analyzes the forces, planned and unplanned, external and internal to school systems, that influence curriculum (Gress and Purpel, 1988, pg. 495). Secondary schools are much more susceptible to those forces than are the elementary schools because there is less agreement on the kinds of learning that should take place (Thornton and Wright, 1963, pg. 145).

Note: Larry Cuban's "*Determinants of Curriculum Change and Stability, 1870-1970*" (Gress and Purpel, 1988, pg. 495-523) and his enhanced version "*Curriculum Stability and Change*" (Jackson, 1992, pp. 216-242) provided the format and all of the content for this section. He deserves credit for putting together a concise and informative article.

Determinants of Curricula Change

"Over the last century, the nation has experienced a number of events and movements that have altered the fabric of our culture. Because schools are culturally bound in our society, logic dictates that they are affected by these forces"(Gress and Purpel, 1988, p. 497). The following include the influential movements that had a profound national impact on education curriculum development.

External Factors

- *Corporate Industrialism.* Industrialization, especially the growth of the corporate organizational model, led administrators to embrace the uniformity and efficiency of "scientific management".
- *Progressivism.* Various, overlapping groups of professionals and practitioners identified as "educational scientists and administrative progressives", led a shift to more child-centered and experience-linked curriculum and theory.
- *Cold War and National Defense.* Origins of the privately and federally funded efforts to toughen up what was taught in public schools were traced to the defensive, hostile and insecure military position of the United States vis-a-vis Russia. Deficiencies in

technical and scientific schooling were linked to the perceived security gap.

- *State and Federal Laws.* Usually the result of special interest lobbying or sweeping social change that produce potent political coalitions, laws have either mandated or produced change in education curriculum. Noteworthy Federal laws include, the Smith-Hughes Act (1917), the National Defense Education Act (1958), the Civil Rights Act (1964), the Elementary and Secondary Education Act (1965), and Title IX of the 1972 Education Amendments.
- *Court Decisions.* The desegregation ruling in Brown vs. Topeka Board of Education (1954) moved many desegregated school districts to modify their procedures for grouping students and adopting texts (Jackson, 1992, p. 228). In Hobson vs. Hansen (1967) the tracking system was dismantled.
- *Publishers.* Students spend a great deal of time reading and memorizing texts. Teachers spend a great deal of time using texts and other published materials. Therefore, publishers respond to the market place by developing new texts, books, worksheets, and audio and videocassette based materials.

- *Foundations*. The Ford, Rockefeller, Carnegie, and Kettering foundations have initiated projects, funded commissions to examine issues and filled gaps in federal funding support. The NSF has been the federal conduit underwriting numerous curriculum development projects since its 1950 establishment by Congress.
- *Professional Associations*. Teachers, professors, superintendents and often industrialists establish national associations such as the NEA, AFT, AAAS, AMS, NCTM, and MAA among others. These associations have a propensity to generate an array of curriculum choices for all educational levels.
- *Individuals*. Some individuals who wrote, spoke, taught, and worked in schools modified both the intended and taught curricula. Teacher, writer and philosopher, John Dewey; researcher and writer, Franklin Bobbitt; researcher and university professor, Edward Thorndike; and researcher, professor, and writer Ralph Tyler all affected curriculum theory, content, materials, and instruction.

Internal Factors

- *Groups and Individuals within the School System.* Student's influence on the taught curriculum is confined to how they participate in the lesson activities, alter what happens, or modify what they study. Teachers revise the intended curriculum and produce the taught one. Committed parents can change the intended and taught curriculum as do Parent-Teacher Associations (PTA) and Ad Hoc groups working methodically and steadily to establish curriculum reform.

Social, political, and economical forces exert the most influence on curriculum reform, while the rest of the determinants act as second and third -tier mediators - softening, selecting, modifying, and promoting variations to those forces instigating the change.

Determinants of Curricula Stability

Most educational literature focuses on curricular change or reform proposals or efforts. Little has been written about the forces that provide continuity or stability to curricula.

External Forces

- *Goals and the Function of Schooling.* The public has frequently stated explicitly what it expects of its

schools. The public also expects schools to change children into competent, economically useful citizens. Teachers and administrators absorb the intentions and socializing functions into their ideologies and behaviors to consciously reinforce punctuality, good work habits, patriotism, and other virtues.

- *Accrediting and Testing Agencies.* Accreditation is viewed as an educational life or death situation that operates as a mechanism of curriculum control. Regional accreditation association's minimum requirements are reinforced through the implicit threat of withdrawing accreditation. This tends to 'stabilize' the curricula model. National tests such as the Stanford and the Iowa are common. School districts often gear portions of their curriculum to successfully passing the tests. Both accrediting and national testing have blurred regional differences to bring a degree of curriculum 'stability' over the years.
- *Textbooks.* With a publishing industry national in scope, most school systems hold onto texts three to five years' minimum and with revisions upwards of a decade. At the secondary school level, texts are

plugged into particular curricula offerings to create interlocking pressure to maintain existing relationships.

- *State and Federal Policies.* We have seen where state and federal policies can initiate change but once in place, these same policies typically take root and become difficult to alter. In the 1980's, state and federal pressures for improved schooling, as measured by standardized testing, prodded school districts toward 'stability' of the curricula content.

Internal Factors

- *Students.* Students views, however derived, and actions (or lack there of) accepted or, on occasion, mildly challenge the existing curriculum and pedagogy.
- *Teachers.* Numerous studies investigating high school curricula have documented a durable continuity in "habits, attitudes, and dispositions" among teachers. "Frontal" teaching, traditional instruction, teacher-centered instruction - the code words vary but the habits of teachers persist. The evidence of teachers sticking to familiar tools, content, and activities continues to mount.

- *Principals.* The multiple and conflicting roles principals play, their aversion to increasing conflict and drawing attention, and the structures they inhabit combine to keep most principals focused on managing existing arrangements - including curriculum.
- *School and Classroom Structures.* The way physical space is allotted, how content and students are organized into grade levels, how time is allotted to tasks, and how school rules govern adult and student behavior are the 'structures' that help shape behavior.
- *The Historical Curriculum.* The deposits in the curriculum left by previous reform efforts' rest unexamined in universal curriculum guides and policies. Models of curriculum making and beliefs introduced decades, even centuries ago, continue as the ways of thinking and making curriculum.

These are the primary forces, external and internal, that determine stability in curriculum. The regularities in the curriculum are too obvious to be dismissed or ignored. All of those forces are anchored in an historical curriculum whose strong influence remains intact.

Method(s) of Data Collection

The method(s) of data collection for this research project were straight forward, relatively simple, yet somewhat tedious. The Internet was used initially to gather, on a macro sense, information on many of the various organizations, associations, professional sources, and agencies engaged in the education field of curriculum development and reform. This information provided a plethora of resource bibliographies that were culled for perceived relevance to reports impacting secondary education curriculum over the past century. The majority of the material was available at Old Dominion University's library where there is an extensive catalog of education related publications. While there are not a great number of published books specifically on secondary curriculum development, there are numerous books on the general topic of curriculum development and reform. The historical and curriculum idiosyncrasies perspective these books provided were invaluable to collating all the information. Journal articles proved to be insightful since they presented opinion and current trends for each timeframe. Like the American population in general, the authors various educational beliefs permeate their work and graphically

highlights the decentralization aspect of the curriculum development profession.

Summary

"The history of curriculum reveals repetitive periods of reform and counter-reform reflecting the shifts in sociopolitical tides. Educators must be able to draw on the larger social situation for curriculum improvement. Concomitantly, they must examine external demands and pressures critically and constructively with a view toward solving problems stemming from the educational situation. Otherwise, the curriculum will be bent to whatever special interests are dominant at a particular time" (Tanner and Tanner, 1995, p. 295). This chapter took a look at the population of books, journal articles and studies advocating various curriculum reform initiatives, with an emphasis on secondary mathematics, during the past century. A review of the many variables, external and internal forces acting on these reform efforts, indicated that while there was change, there was also "stability" inherent in the whole process. "Economic, demographic, political, social, and cultural changes mediated by groups and individuals reshape schooling inexorably and alter policies and practices at the district and school levels. Such interest group pressures at work in a decentralized system

of school governance have produced a broad array of incremental, rather than fundamental, changes in the intended curriculum and much less modification in what teachers teach" (Jackson, 1992, p. 217). The paradigms in curriculum development exhibit a cyclic longevity tied to the prevailing perception of the American public, government institutions, corporate and economic well being, and the educational trends of the time.

CHAPTER IV

FINDINGS

"As a field of professional practice and scholarly inquiry, curriculum has a rich tradition and varied perspective" (Gress and Purpel, 1988, p. VII). Reshaping curriculum along new lines of different educational and social philosophies has usually been proceeded by some organization's findings and report or events transpiring during a specific timeframe. Unfortunately, "curriculum construction in the United States is generally conducted in a shockingly piecemeal and superficial fashion. Innovations are often little more than jargon and the whole process is influenced mainly by mere educational vogue" (Zais, 1976, p. XI). The curricula enterprise is a complex profession that has experienced continuous reform efforts since the 1890's. Numerous reports on American secondary school mathematics, issued by commissions or committees over the past 100 years, have evolved curriculum development efforts into a profession of specialists. While Chapter II highlighted significant studies and five "landmark" reports issued since 1890, this chapter compiles the prodigious amount of activity undertaken on secondary education curriculum development in general.

1890-1920

Significant curriculum development events began to occur in this timeframe. Studies and reports issued include:

1. *1893 Report* by the Committee of Ten. Discussed in Chapter II, this is the first "landmark" curriculum reform study.
2. The *College Entrance Examination Requirements Committee* was appointed in 1895 by the NEA to answer how to introduce the programs recommended by the Committee of Ten. A "*Summary of Principle Conclusions*", totaling eleven recommendations was provided to the NEA. Responding to this report, the College Entrance Examination Board was established in 1900. This board based its recommendations for mathematics requirements and tests on the curriculum proposed by the College Entrance Requirements Committee. However, widespread use of these tests did not occur until after World War II (Krulik and Weise, 1975, p. 62).
3. In 1908 the NEA and the American Federation of Teachers of Mathematics (AFT) established the committee of Fifteen on the Geometry syllabus. The

Report of the Committee of Fifteen was presented in 1911 (Krulik and Weise, 1975, p. 63).

4. The *International Congress of Mathematics* met in Rome starting in 1908. The American portion of the committee was chaired by David Eugene Smith and between 1911 and 1917 thirteen (13) reports were circulated in the United States (Krulik and Weise, 1975, p. 63).
5. The NEA created the *Committee on Economy of Time* in 1911. "The committee's four reports were published as the yearbooks of the National Society for the Study of Education from 1915-1919 (Tanner and Tanner, 1995, p. 74).
6. In 1918 the NEA established the Commission on the Reorganization of Secondary Education. This commission's report, the *Cardinal Principles of Secondary Education*, is considered the second "landmark" study in the curriculum field.

1920-1940

The frenzied activity of the early 1900's slowed somewhat from 1920-1940 due to the Great Depression and the influence of educational philosophies such as John Dewey's progressive education movement.

1. The Mathematics Association of America (MAA) organized the National Committee on Mathematics Requirements in 1916. The MAA published its report in 1923 under the title *The Reorganization of Mathematics in Secondary Education*. Commonly referred to as *The 1923 Report*, this was the third "landmark" curriculum development study.
2. Under the auspices of the National Society for the Study of Education (NSSE), Harold Rugg put together a committee in the mid-1920's to reach some consensus on a common foundation of curriculum making. Eighteen central questions were published as the heart of Part II of the two-volume 1927 NSSE Yearbook and titled *The Foundations of Curriculum Making*. The eighteen questions themselves became known as "*The Twenty-Sixth Yearbook*" (Willis, Schubert, Bullough, Krider, and Holton, 1993, pp. 229-230).
3. *What the High School Ought to Teach* was prepared in 1940 by the Special Committee on the Secondary Curriculum and published by the American Council on Education. It was the forerunner for the "life adjustment" education philosophy (Willis, Schubert, Bullough, Krider, and Holton, 1993, pp. 229-230).

4. *Mathematics in General Education; The Progressive Education Association Report* was published in 1940 presenting a "mathematics curriculum based in concrete problem situations that arise when meeting the needs encountered in basic aspects of living" (Krulik and Weise, 1975, p. 74).

1940-1960

This timeframe is bounded by the upheaval of World War II, the beginnings of the Cold War and the intellectual flagellation triggered by the advent of Sputnik. Its legacy is 'modern' or 'new' mathematics programs that permeate the decades of the 60's and 70's.

1. *The Commission on Post-War Plans,* created by the NCTM Board of directors in 1940, issued three reports in 1944, 1945, and 1947.
2. *The University of Illinois Committee on School Mathematics (UISCM)* was the first large-scale project designed to prepare materials for secondary school mathematics expressing the 'modern' view. It was initiated in 1951 with financial assistance from the Carnegie Foundation and the newly established National Science Foundation (NSF).
3. The College Board of the Commission on Mathematics was formed in 1955 and its report, *Program for*

College Preparatory Mathematics, contributed to gradual changes in the secondary mathematics curriculum (Jones and Valentine, *Mathematics Teacher*, May 1984).

4. The Schools Mathematics Study Group (SMSG), supported by the NSF, was organized in 1958. It issued its first report, *The Program for College Preparatory Mathematics*, and materials on secondary mathematics in 1959 and remained quite influential throughout the 1960's.

1960-1980

The 'new' or 'modern' mathematics movement spawned a plethora of committees and/or commissions resulting in an avalanche of reports.

1. Sponsored by the MAA, the *Committee on the Undergraduate Program in Mathematics (CUPM)* distributed three reports in 1961, 1964, and 1966. These reports recognized the requirement for extensive in-service training of teachers required by the 'new' math.
2. *The Cambridge Report of 1963* emphasized the 'discovery' approach and advocated a compressed mathematics program placing college level courses into the secondary curriculum.

3. Joining the movement to reform mathematics curriculum in 1965, the *Secondary School Mathematics Curriculum Improvement Study* was initiated at Columbia University. Its goal was to reconstruct school mathematics "from a global point of view" (Kline, 1973, p. 20).
4. *The Southern-Illinois Project - Comprehensive School Mathematics Project (CSMP)* of 1967 was initially a secondary curriculum intended for the bright, highly motivated students organized around highly individualized teaching strategies (Krulik and Weise, 1975, p. 82). Classroom instruction was based on the 'track' system, study carrels with small-group interaction and team teaching.
5. The National Association of Secondary School Principals, whose report *American Youth in the Mid-Seventies* (1972) recommended increased "active learning" programs in the community (Wiles and Bondi, 1989, p. 316).
6. The President's Science Advisory Committee, whose report *Youth: Transition to Adulthood* (1973) advocated the creation of alternative high schools and occupational high schools (Wiles and Bondi, 1989, p. 317).

7. The Institute for the Development of Educational Activities (IDEA), whose report *The Greening of the High School* (1973) called for a new type of institution for modern students, with an emphasis on individual needs and student choice (Wiles and Bondi, 1989, p. 317).
8. The 1974 *NACOME* report tried to address the growing resistance to 'modern' mathematics.
9. The U. S. Department of Education, HEW, whose report *National Panel on High Schools and Adolescent Education* (1975) recommended decentralization of the comprehensive high school and reduction of the secondary school day to 2-4 hours (Wiles and Bondi, 1989, p. 317).

1980-Present

By this timeframe curriculum development had become institutionalized as an educational field of profession. "The foray of national reports on curriculum reform continued unabated during the eighties and nineties" (Tanner and Tanner, 1995, p. 453).

1. In 1980 the NCTM published *An Agenda for Action: Recommendations for School Mathematics in the 1980's.*

2. 1983 National Science Board (NSB) of the NSF, published *Educating Americans for the 21st Century.* This report encouraged the NSF to promote curriculum development for mathematics (Tanner and Tanner, 1995, p. 453).
3. *A Nation at Risk: The Imperative for Educational Reform* issued by the National Commission on Excellence in Education in 1983, was by far the report that garnered the most media exposure and influence on a decade of curriculum reform (Tanner and Tanner, 1995, p. 454). This was the fourth "landmark" curriculum development study.
4. The Task Force on Education for Economic Growth of the Education Commission of the States, issued a 1983 report, *Action for Excellence*, that advocated an educational partnership with corporate industry.
5. The Ad Hoc Committee on Resources for the Mathematical Sciences was established by the NRC and presented its findings in the 1984 report, *Renewing U.S. Mathematics: Critical Resource for the Future* (known as the "David Report").
6. The American Association of School Administrators (AASA) surveyed 300 school districts to develop the

data bank on which the 1985 report, *Improving Math and Science Education*, was based.

7. *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*, was undertaken by the NRC and published in 1989. Its basic premise was that mathematics education in the United States needed rebuilding.
8. In *Renewing U.S. Mathematics: A Plan for the 1990's*, the NRC updated the 1984 "David Report" with progress seen in increased federal funding support but concluded that major problems still existed.
9. *America 2000: An Education Strategy*, announced by President Bush in 1991 and subsequently repackaged by the Clinton administration under the rubric *Goals 2000*, established the federal governments role in education. This was the fifth "landmark" education study.

Summary

Although not all of the reports listed here dealt directly with secondary mathematics curriculum reform, their impact on the overall curriculum of secondary education cannot be questioned. *The Cardinal Principles, A Nation at Risk*, and *Goals 2000* are three "landmark' studies that impacted and galvanized the curriculum reform movement

across all core academic subjects. The *1893 Report* by the Committee of Ten and *The Reorganization of Mathematics in Secondary Education* were two mathematics curriculum reform studies that initiated and then defined the professional field of curriculum development. Undoubtedly, with the explosion of resources and the methods of disseminating information, the study of education curriculum reform will remain a robust endeavor.

Chapter V

Summary, Conclusions and Recommendations

Continuous secondary mathematics curriculum reform developments have been occurring since 1890. Previous chapters identified significant reports effecting those developments that were issued by committees or commissions over the past century. This chapter provides a perspective on the reports making critical impacts on the curriculum development profession in general. "In a period of some seventy years organized curriculum development in the United States evolved from the preoccupation of a handful of educational statesmen operating within the relatively cloistered setting to the concern of a virtual army of specialists and a matter of urgent national concern" (Gress and Purpel, 1988, p. 44). "During the past half-century, the program of the school has been altered on numerous occasions to adjust to changing society or to serve special groups of learners. Wars, depressions, revolutions in transportation and communications, social trends, and a growing body of knowledge about learners themselves have acted to stretch the curriculum of the school in America" (Wiles and Bondi, 1989, p. 5). Defining the scope and direction of curriculum development can help us build on successes and avoid repeating failures. "It provides us

with insights about possibly important factors to be considered in making intelligent discussions about present practices and proposals for the future" (Tanner and Tanner, 1993, p. 28). This country is again at a frustration threshold with public school education. Traditional public-school supporters are beginning to champion alternative concepts such as charters, vouchers and other market-based alternatives (Toch and Garrett, 1998, p. 17). Education continues to be the number one social issue that requires the rebuilding of confidence in the traditional school system.

Conclusions

1890-1920

Two 'landmark' reports, the *Committee of Ten Report* (1893) and *The Cardinal Principles of Secondary Education* where produced during this period.

The *Committee of Ten Report*, "has been interpreted in curriculum textbooks, as well as in explicitly historical words, as an obstacle to be overcome in the American curriculum's procession of progress" (Jackson, 1995, p. 163). Distracters charged the Committee's report failed to take into account the enormous variability within the high school student population, reflected elitist bias for imposing college domination on secondary curriculum, and

portrayed anti-democratic overtones (Jackson, 1995, p. 163). What the *Committee of Ten Report* indisputably accomplished was to initiate the establishment of the curriculum development profession.

"By contrast, *The Cardinal Principles* report, whose famous seven aims reflected a distinctly functional, rather then academic, orientation to curriculum making, was interpreted as representing an important corrective to the short-sighted and misguided views of the framers of the Committee of Ten" (Jackson, 1995, p. 163). The Cardinal Principles established a basis from which curricula would encompass virtually all of life's experiences.

1920-1940

The 'landmark' report of this period was *The Reorganization of Mathematics in Secondary Education.* "During the thirties the *1923 Report*, was often referred to as providing guidance for content selection and organization in the preparation of textbooks' (Krulick and Weise, 1975, pp. 64-65). This report was instrumental in recommending requirements that secondary mathematics teachers needed to satisfy.

1940-1960

Although no one report from this timeframe might be considered a 'landmark' work, curriculum reform development

began a tumultuous period of unprecedented experimentation. This period is identified with the initiation of the 'new' or 'modern' math concepts that spawned countless curriculum reform programs.

1960-1980

The 'new' math reforms of the 1950's were the elements of more radical reform efforts that began and often ended during this 60's and 70's. Significant curriculum reform efforts tried to compress college level mathematics into the secondary level but for the most part failed due to a lack of source material, in-service training, standards, and assessment feedback. Disenchantment soon led to a public outcry to "return to the basics" that culminated in the early 1980's with the release of scathing rapprochement of the entire American education system.

1980-Present

The first 'landmark' report of this period, *A Nation at Risk: The Imperative for Education Reform (1983)*, jolted this country into a bevy of curriculum reform development efforts. "Collectively the United States conceded that American economic power was not as pervasive as it once had been, sought reasons for this state of affairs, and searched for ways to rectify this widely perceived national problem" (Willis, Schubert, Bullough, Kridel, and Holton,

1993, p. 401). With *A Nation at Risk*, the National Commission on the Excellence in Education "concluded that poor schooling was what put the nation at risk economically and socially, and that rigorous standards were necessary to alleviate the problem" (Willis, Schubert, Bullough, Kridel, and Holton, 1993, p. 401). Although the federal government charged state and local governments with the responsibility for funding recommended educational reforms, less than a year after *A Nation at Risk* 260 'blue ribbon commissions' had been created throughout the country. Perhaps the major curricular influence of *A Nation at Risk* was to give greater national credence to the idea that a single curriculum was appropriate for everyone and that educators could not be entrusted with developing curriculum programs. "The political power of *A Nation at Risk* in focusing the nation's beliefs about education can hardly be over emphasized (Willis, Schubert, Bullough, Kridel, and Holton, 1993, p. 402).

America 2000/Goals 2000 is the second 'landmark' report of this period. This report called for a 'revolutionary' transformation of schools and delineated six national goals to be attained by the 2000. "Renewed impetus was being given to the test-driven curriculum and to the announced plan to assess student achievement in

meeting "new World Class Standards" through "American achievement tests", with priority given to the sciences and mathematics. The immediate response to *Goals 2000* was for various professional associations to establish achievement standards for the subject fields" (Tanner and Tanner, 1995, p. 468).

Recommendations

The American public education system is being continually buffeted by contradicting pressures for reform and counter reform. Shifts in political priorities, media frenzy to report bad news, and self-flagellation over technical or economic incompetence have all driven this country at various times over the past 100 years to initiate unnecessarily extreme educational reform measures.

Curriculum development professionals should adhere to a prescribed set of standards.

1. Understand the connection between various studies throughout the secondary mathematics curriculum. A segmented approach taken in treating a curriculum reform independent of other studies leads to a lack of consensus.
2. Take into account previous research and experience. This will provide a base of success for practices on which to build.

3. Research must be thorough and controlled. There is a tendency to claim as an experiment any departure from conventional practices without having the "data" to back up these claims.
4. Understand the nature of the learner. Demographics are in a constant state of flux. What works in one region may not be appropriate in another.
5. Account for advances in technology but do not let it become the sole driver of a reform program.
6. Involve teachers in the development and evaluation of proposed curriculum reforms. Teachers are resident experts who are capable of putting reform proposals in the context of classroom applicability.

"A fundamental principle of curriculum improvement is that it is both continuous and cumulative. The idea is to build on, not demolish, the gains of proceeding eras" (Tanner and Tanner, 1995, p. 707). There are very few "original" ideas being proposed in the curriculum development profession. The legacy of many previous reform efforts are often renamed and repackaged with slight modification. The reasons for instituting widespread curriculum reforms tend to be cyclic whether attributable

to the stronger of social, technological, economical, or political influences of the period.

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APPENDIX A

Professionals in the Curriculum Development Field

The battle to improve and expand the curriculum can be attributed to a handful of early pioneers that made significant impact with their writings at critical points. Although most authors peg 1915-1920 timeframe as the emergence of curriculum as a distinctive field of professional activity (Gress and Purpel, 1988, p. 32), curriculum development efforts in this country can trace its roots to the 1890's.

Charles W. Eliot (1834-1926)

On July 9, 1892 the National Education Association at their National Council of Education meeting commissioned the *Committee of Ten.* "In part it was a response to school leaders who were upset about the huge variations in expectations by colleges as represented by questions on college entrance examinations. Still another part of the impetus for the Report was the desire of Charles W. Eliot, the Committee's chair and President of Harvard" (Willis, Schubert, Bullough, Kridel, and Holton, 1993, p.85).

Charles W. Eliot was a powerful NEA figure and leader in educational reform. He proposed a number of solutions to the growing concern about the rising age of entering

freshmen at Harvard and most American universities. "As he saw it, the problem lay in both the organization and the curriculum of elementary and secondary education" (Tanner and Tanner, 1995, p. 41). He proposed shortening the elementary curriculum from ten to eight years by restructuring the program in arithmetic to six years. This would make room for algebra and geometry in the 7th and 8th grades. He believed that foreign language could be introduced in 4th or 5th grade, that the time devoted to grammar was too long and could be truncated by culling memorization, and that natural science be taught through demonstrations and laboratory experience (Tanner and Tanner, 1995, p. 41).

Eliot possessed optimism about human intellectual capacities and was ideologically a mental disciplinarian. In 1888, he gave a speech entitled 'Can School Programs be Shortened and Enriched' before the NEA's Department of Superintendents. This speech laid the foundation of Eliots desire to "loosen the hold of classical studies (four years of Latin, three of Greek) on collegiate entrance requirements" (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 85). He was, therefore, a strong advocate for the elective system not just in higher education, but in high school and upper elementary grades" (Gress and

Purpel, 1988, p. 47). As the Committee of Ten's chairman, Charles W. Eliot gained assess to the forum from which he generated public interest and debate.

John Dewey (1859-1952)

"Far more than any other person, John Dewey has influenced debate about curriculum" (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 123). Recognized and honored the world over, Dewey's contributions to education were revolutionary. Building on Francis Parker's 'Quincy System' developmental concepts, he founded the Laboratory School at the University of Chicago in 1899 to test his philosophical and psychological principles. These pragmatic principles became a "basis for progressive education, a movement which was to burgeon during the first several decades of the twentieth century and fundamentally change schools" (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 123). In 1902 Dewey published *The Child and the Curriculum.* This work reshaped the debate on "competing curriculum focal points of subject matter, individual, and society into a new, flexible, and dynamic relationship in terms of how each contributes to the development of experience" (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 124).

While Dewey and his progressive movement focused primarily on the elementary curriculum, he also wrestled with the highly volatile secondary issues of vocational education and fragmentation of the curriculum due to increasing specialization. In 1901 Dewey proclaimed that, "It was time for separate vocational high schools to become integral parts of the city high school". He believed that "the conflict in studies could be resolved by viewing the curriculum in the context of the needs of the individual and by viewing opposing elements as complementary" (Tanner and Tanner, 1995, p. 94). Dewey wrote, "The principle to follow in curriculum reorganization was to view all school studies in light of their place in human activities". Subsequently, "education reformers followed his lead in developing specific principles for reorganizing the secondary school curriculum (Tanner and Tanner, 1995, p. 94).

Although Dewey remained a force in the education reform movement throughout the first half of the twentieth century, some were suspect of his actual influence. "A commonly expressed version of the controversy over Dewey's influence is that while his own ideas were not actually translated into visible practice, the easily contorted versions of his ideas promoted by his followers in fact

were (Jackson, 1992, p. 171). In the end, the most promising explanation of Dewey's ideas on curriculum, while studied and selectively carried forward into practice, were just as likely to be converted into a slogan system serving the reformers involved according to the prevailing situation (Jackson, 1992, p. 173). Whether a proponent or critic of John Dewey, it is acknowledged that he became a symbol of the American educational reform profession.

J. Franklin Bobbitt (1875-1956)

Curriculum as a specialized field of study emerged in 1918 when J. Franklin Bobbitt wrote *The Curriculum*, the first book devoted to this subject (Zias, 1976, p. 5). *The Curriculum* focused exclusively on curriculum matters and provided a comprehensive explanation of curriculum principles and specific procedures for creating curricula (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 163). A University of Chicago faculty member in educational administration, Bobbitt embraced the scientific management method in curriculum development. This psychology was derived from the work of Wilhelm Wundt in Germany (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 163). An active member on the Committee on Economy in Education, Bobbitt developed the theme that education must follow the example of industry and focus on

the product (Tanner and Tanner, 1995, p. 71). He was highly influenced by the social efficiency movement, a reaction to the ravages of World War I, and procedures emphasizing efficiency, standardization and specialization (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 163). Bobbitt recognized that curriculum development was a complicated political decision, that it was a local affair best suited to a particular constituency and that educational objectives could be discovered empirically (Jackson, 1992, p. 24). His curriculum legacy consists of two policies that stem from his advocacy and continue to this day: (1) Business values and procedures are the model for educational administration resulting in economic vice educational decisions. (2) Education and the government have enlisted the expertise of industry to solve pedagogical problems (Tanner and Tanner, 1995, p. 72).

Harold Rugg

"If Franklin Bobbitt's *The Curriculum* marked the birth of curriculum as a professional field of specialization, NSSE's 26th yearbook, including Rugg's historical essay, marked its coming of age" (Jackson, 1995, p. 160). Harold Rugg was a professor at Columbia's Teachers College, who brought together varying and opposing viewpoints so that curriculum specialists could become

masters of a common body of knowledge and skills (Tanner and Tanner, 1995, p. 107).

In 1924, the National Society for the Study of Education (NSSE) commissioned the Committee on Curriculum Making, chaired by Harold Rugg. The committee surveyed selected school systems and established that a national movement for curriculum reform was underway. The committee also discovered that curriculum development was using the 'shotgun' effect where causes were dropped or added without evaluation or overall design (Tanner and Tanner, 1995, p. 108). The committee stressed three tasks: (1) determine the objectives of education, (2) develop modes and materials of instruction, and (3) detail the organization of learning experiences. Rugg's contribution was to establish principles of curriculum development for a newly emerging field of university study and systematic professional practice (Tanner and Tanner, 1995, p. 111).

Ralph W. Tyler (1902-?)

"If any single volume deserves to be called the Bible of curriculum making it is certainly Ralph Tyler's *Basic Principles of Curriculum and Instruction,* which began as a syllabus for a course Tyler taught at the University of Chicago" (Jackson, 1995, p. 24). Tyler said, "the book attempts to explain a rationale for viewing, analyzing, and

interpreting the curriculum and instructional program of an educational institution". Commonly referred to as "the Tyler rationale", the book "identified four basic steps that are central to all curriculum analysis, design, or development that include determining: (1) purposes, (2) learning experiences, (3) organization, and (4) evaluation" (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 393).

"The widespread influence of the Tyler Rationale is evident in the similarity between Tyler's topics and those used in teachers manuals of textbooks, lesson plan forms, methods textbooks used in teacher education, curriculum guides, curriculum policy documents, and a multitude of other places" (Willis, Schubert, Bullough, Kridel and Holton, 1993, p. 394). "Although various modifications have been proposed, Tyler's explication of the curriculum paradigm has not been fundamentally changed" (Tanner and Tanner, 1995, p. 234).

Charles W. Eliot, John Dewey, J. Franklin Bobbitt, Harold Rugg, and Ralph W. Tyler were pioneers in establishing the profession of curriculum development specialists. Their efforts laid the cornerstone to the prodigious activity of curriculum development,

modification, and refinement that has become prevalent over the past two decades.