

**Changes in Mathematics Curricula:
A Socio-Historical Analysis of
Mathematics Education in the Public Schools of New York.**

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This study examines socio-historical analysis of the development of Regents level mathematics curricula in the public schools of New York State since 1866. The overall objective of the proposed study is to illuminate relationships between the micro-level practices of schools and the macro-level structures of society. Fundamental research questions to be addressed are: 1) How has the classification, framing, and evaluation of Regents level mathematics curricula in the public schools of New York changed since 1866? and 2) How has popularization and democratization influenced the contents, structure and academic rigor of Regents examinations? Using Basil Bernstein's theories of educational transmissions and pedagogic discourse as a theoretical framework for the study, this paper will use samples from New York State mathematics regents over a hundred year time frame to analyze the social, educational and societal factors that influenced mathematics curriculum and assessment. Data from a collection of 1,465 Regents mathematics examinations, dating from 1866 to the present, will be coded and analyzed to identify changes and trends in New York State's secondary school mathematics curricula.

In 1864, during the Civil War, the legislature of the State of New York enacted a law granting the Board of Regents authority to create entrance examinations for use in all of the high schools and academies of New York State (Folts 1996). The idea was to establish a system of educational credentials associated with minimum standards of student achievement on written examinations in five subject areas: reading, writing, arithmetic, grammar, and geography. Through state sponsorship and standardization, these Regents credentials would be a form of currency, and would have recognized value between educational institutions throughout the state. Equally important, academies and high schools throughout New York State would receive their allocations from the state literature fund based on their count of "academic scholars" who had passed these examinations (SED 1987). Because state funding of schools was tied to student achievement on examinations, the Regents examination system would quickly become an important quality control system used by the State to influence the micro-level practices of schools (SED 1965). These early Regents examinations assessed student readiness for secondary schooling and were known as "preliminary" examinations. The first Regents preliminary examinations were administered on November 11, 1866, and they continued to be administered each and every year from 1866 through the present.

Subsequently, from 1879 to the present, Regents academic examinations have been used to qualify students for Regents diplomas. Over these many years, the Regents examination system has become a hallmark of the New York public education system, and the collection of Regents credentials became associated with high academic standards and a means of differentiating elite students in pursuit of higher levels of educational attainment.

The consistency with which Regents preliminary and academic examinations have been administered year in and year out since 1866 is important. As historical artifacts of public education in the state of New York, consistently administered Regents examinations provide opportunities for analysis of historical trends in: 1) the classification of knowledge in public school curricula; 2) the pedagogical practices associated with the transmission of knowledge; and 3) the evaluation and recognition of student achievement through high stakes testing. These trends can be examined in the context of contemporaneous historical events and evolving societal structures, thus leading to increased awareness and understanding of relationships between schools and society. Accordingly, a detailed analysis of these examinations, in terms of their contents and structures, is the focus of this study.

From 1866 through 1878, preliminary examinations were associated only with the credentialing of academic scholars. From 1879, when the Regents examination system was expanded to include academic examinations that qualified students for Regents diplomas, through 1906, the New York Board of Regents recognized no diplomas other than their own Regents academic diplomas, which were earned by passing Regents academic examinations. In 1906, the Board of Regents authorized the awarding of non-academic diplomas without state examinations. The importance of recognizing non-academic diplomas was huge, because it was accompanied by relaxed funding rules that allowed for more progressive curricula, and it enabled the tracking of students into academic and non-academic curricula. Most students who graduated from secondary schools in New York subsequent to 1906 did so with non-academic diplomas, and the academic examinations continued to be designed for, and administered to, elite middle class students, who were described in 1965 by the New York State Education Department as students with "...average and above average academic abilities" (SED 1965, p. 6). Students, perceived to have lesser abilities were presumably tracked into non-academic curricula. Under this system, New York schools developed a pattern of tracking elite students into curricula associated with Regents examinations, and Regents diplomas became coveted credentials in public schools throughout New York State. In 1996, however, the Board of Regents began to dismantle this reified tracking system (Folts 1996).

Under the guidance of the Board of Regents, the New York State Education Department decided in 1996 to: 1) eliminate non-academic secondary school diplomas for all general education students; and 2) require all general education secondary school students to take and pass five academic examinations (in English, mathematics, science, global history and U.S. history) in order to earn a Regents academic diploma (Folts 1996). An incremental program to eliminate almost all non-academic diplomas was announced shortly thereafter, with the new requirements being effective for all secondary school students entering ninth grade during the 2008-2009 school year. Thus, a century old practice of tracking students into academic and non-academic curricula is ending in New York State and the Regents diploma as an academic credential is no longer focused solely on middle class students of above and above average academic abilities.

Instead, Regents diplomas and a subset of Regents examinations are now focused on all classes of students enrolled in New York State's public schools. In recent years, as the Regents diploma becomes popularized, the number of students taking the five academic examinations required for graduation has exploded. Concurrently, the academic examinations not required for graduation have not been popularized. This situation provides a research opportunity to look at the effects of popularization on the credentials values of both Regents diplomas and individual Regents academic examinations associated with elite and non-elite students.

Research Questions and Theories

Two research questions, which are central to this study, arise from the preceding narrative concerning the history of the Regents examinations and the students who took them. These are:

- How have the classification, framing, and evaluation of Regents level mathematics curricula in the public schools of New York changed since 1866? And
- How has popularization influenced the contents, structure and academic rigor of Regents examinations?

To examine these questions, a proposed research model has been developed. This model depicts four historical timelines/narratives that will be developed and subjected to critical analyses through the lenses of two theories. The first theory, which frames the first research question, is Basil Bernstein's theory of educational transmissions (Bernstein, 1977, 1990). The second theory, which frames the second research question, is credentials theory. This paper will focus on the first question and theory. Both theories illuminate our understanding of the social stratification effects of public schools. See Figure I-1.

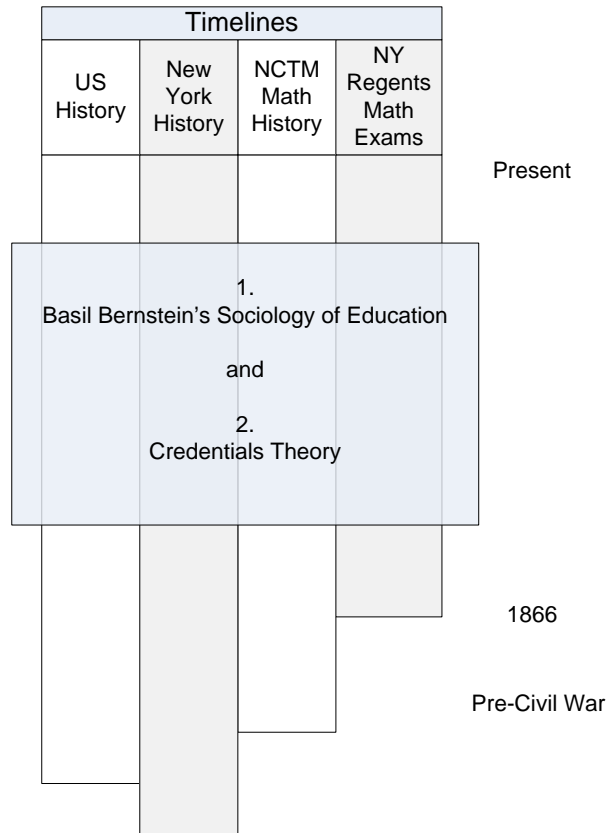
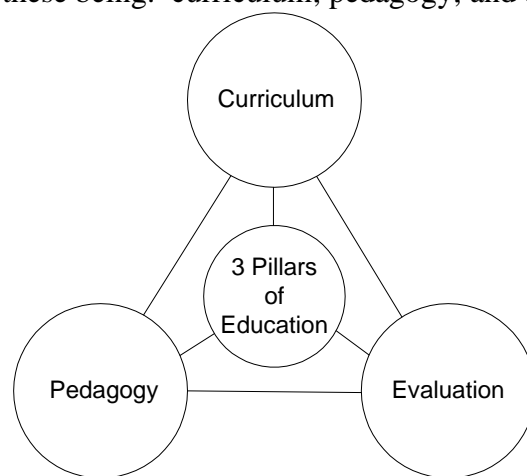


Figure I-1

The two theoretical lenses that underlie the proposed research, which are shown in the horizontal row that crosses the four vertical timelines in Figure 1, should be interpreted as extending to both the beginnings and the ends of each of the four vertical timelines.

Basil Bernstein presented a structuralist view of education when he posited that there are three pillars of public education, these being: curriculum; pedagogy; and evaluation.



Bernstein's Three Pillars of Education

Figure 2-1

In explaining the three pillars of education, Bernstein wrote,

Formal educational knowledge can be considered through three message systems: curriculum, pedagogy, and evaluation. Curriculum defines what counts as valid knowledge, pedagogy defines what counts as valid transmission of knowledge, and evaluation defines what counts as a valid realization of this knowledge on the part of the taught (Bernstein 1977. P. 85).

In this study, Bernstein's theory of educational transmissions provides the lens through which curriculum, pedagogy, and evaluation -- the micro-level practices of schools -- are related to the historical events and changing macro-level social structures of our society.

For example, algorithms and mathematical constructs are among the highest levels of abstraction routinely used by the human mind, and pure mathematicians have sometimes been caricatured as living in an abstract world devoid of real-world connections. Keith Devlin, when describing mathematics as part of the highest level of human abstraction, writes, "Mathematical objects are entirely abstract; they have no simple or direct link to the real world, other than being abstracted from the world..." (Devlin, 1997: 121). Thus, the teaching of high school mathematics can be understood as one in which abstract algorithms and mathematical constructs are articulated as elements of an elaborated code that is autonomous of evoking social structures. On this view, the evoking context of a problem on a Regents mathematics examination is seen as relevant primarily as a means through which the student is instructed to retrieve from memory a more abstract, hence more autonomous, elaborated code of an algorithm or mathematical construct. The context of the problem is not a call for the student to use past experiences in the articulated context to solve the problem. Accordingly, one would expect to find in a study of past Regents examinations that algorithms and mathematical constructs are embedded in numerous social contexts, and that the elaborated and autonomous codes of the algorithms and mathematical constructs are independent of their evoking social structures. Such a finding would be consistent with Bernstein's code theory, can be verified through the proposed study, and would illuminate the mechanisms through which public school mathematics facilitates social stratification.

References

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