

Career Opportunities for Girls and Mathematics Education 1890-1920 in the US

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Abstract

This study is dedicated to evaluating the effect of career opportunities prevalent among the female population in the United States on women's mathematics education during the time high school education came to be accepted as a necessity for most children in the United States. The time period of 1890 through 1920 in the United States, called the Progressive Era, is known for its social, political, and education reforms. Shifting ideology and newly enacted laws for compulsory education sent students streaming to public schools, which in turn forced schools to accommodate a student population that was increasingly diverse, both in upbringing and in prior knowledge. Thus, in order to create a place for each child in the public school system, educators saw the solution in the diversification of education. The position of diversified education was to adapt school curriculum to meet utilitarian demands and to incorporate vocational, manual, commercial, and industrial studies into the public school system. Differentiated curriculum demanded the elimination of some subjects, and this movement specifically targeted mathematics, along with other subjects. The subjects that were eliminated differed, based on the professions foreseen by (or for) students, and since many of the vocations were gender specific, so was the education. This study will review data from multiple sources and perspectives—government, contemporary publications, and private manuscripts and letters written by prominent educators and historians—to analyze how high school mathematics curricula for girls were affected by the shifting job market demands.

Keywords: commercial education history, commercial mathematics, differentiated education, female careers, female mathematics education.

Introduction

This study continues the research dedicated to history of female mathematics education during the years 1890–1920 in the United States with focus on how labor opportunities for women during the reviewed period affected mathematics curricula offered in public high schools.¹

In order to accurately assess the education provided in public schools during the specified time period, it is necessary to examine them separately from private schools. The organization and administration of private schools often differed from that of public schools. One notable distinction was the absence of centralized control in private schools. A review of *A Handbook of American Private Schools* (Sargent, 1918), which provides a comprehensive list of private schools categorized by location, revealed that it was not possible to create a uniform summary of standardized requirements and educational objectives. While many coeducational and girls' schools offered college preparatory education, there were schools that

¹ In this study, the terms *high school* and *secondary school* are used interchangeably and refer to grades 9–12.

specialized in different areas of study, such as religious training, music, art, languages, and home economics. Given this finding, this study focuses solely on the mathematics education provided by public high schools.

The years 1890–1920 marked a period in the United States called the Progressive Era that became one of the most curious and interesting chapters of American public high school education. According to the U.S. Bureau of Education's *Report of the Commissioner of Education for the Year 1895–96* (1897), through 1886, the number of secondary students (grades 9 through 12) attending private schools (academies and preparatory schools) exceeded the number attending public schools. However, by 1895, this statistic had flipped, and the number of students enrolled in public high schools was recorded at 350,099, whereas the number of students attending private schools was recorded at only 118,347. Furthermore, in 1871, when the Bureau of Education started to collect information on enrollment, and for nearly 20 years after, high school enrollment reports included students who were actually pursuing elementary studies even though they were attending a high school. Only in 1890 did it become possible to separate secondary students from elementary students.

Within the next two decades, as reported by the *1916–1918 Biennial Survey of Education in the United States*, total high school enrollment increased by 710% (U.S. Bureau of Education, 1921). The student population in public schools became very diverse, combining students of different nationalities as well as different social and economic statuses². This diversity in the student population was especially visible in the urban areas. Furthermore, the reviewed period marked the expansion of white-collar jobs, including an increased demand for bookkeepers, cashiers, office clerks, and telephone operators, which were generally considered to be jobs for females (Rury, 1991). The increase in these types of jobs occurred primarily in metropolitan settings, including New York City, whose diverse population and job market growth exemplify the developments in education at the time. Therefore, this study mostly concentrates on New York City.

Significant works have been dedicated to the formation of the high school education system in the United States (Krug, 1969), to the history of public schools in New York City (Ravitch, 1974), to the development of vocational education and adjustment of mathematics curricula to meet the practical demands of the students, which subsequently often eliminated mathematics as a required subject from the public school courses (Kilpatrick, 2009), and to the overall history of women's education in the United States (Woody, 1929). However, research of the history of female mathematics education during the Progressive Era calls for a wider perspective and an expansion of the analysis of how job market demands influenced mathematics education for girls, given the changes that took place in public high school education at the time.

² The northeastern region of the United States experienced a particularly large increase in population during the reviewed period, mostly due to immigration (Tyack, 1974).

This study will review the development of mathematics education in relation to the changes that took place in the job market for women by analyzing the following themes:

- Changing functions of high school education and its effect on the mathematics curricula
- Changes that took place for women in the labor force
- Careers that were available to women and the educational requirements for those careers, in particular the relationship between job opportunities for females and mathematics education

Methodology

This study attempts to portray historical events by following the ideas and methodologies of Schubring (1988 as cited in Karp, 2014), which state there are several studies that are relevant to historical research. One of these studies is “the state of mathematics within general education for all and within professional education” (p. 12). Keeping in mind this reason, available sources should be analyzed to comprehend the interplay between mathematics and other developments occurring within the educational system being studied.

The analysis of the collected data relies on the author’s interpretation of the broad range of information obtained from numerous sources in various forms. The official documents pertaining to general education, mathematics education, and college admission testing; periodicals dedicated to education and gender topics; newspaper ads for job openings; internal school publications; and personal manuscripts of individuals involved in girls’ learning, particularly mathematics learning, including teachers and leaders, were of special interest in this study.

At the same time, Karp (2014) warns of the dangers of generalization arising from the fact that mathematics education and its implementation in U.S. schools tends to happen on the local level. Therefore, research must consider the nature of the region in question. This does not mean that theorization cannot be achieved, but conclusions should not be formed before a review of relevant and reliable facts is complete. Consequently, when referencing this study into how the history of mathematics education unfolded during the Progressive Era through the lens of gender, one must be cognizant that gender practices may differ by families, religious views, schools, and regions.

Changing Functions of High Schools

One of the major developments connected to education during the reviewed period was providing the majority of children and youth with the opportunity to attend free and public high schools. High school education had existed in the United States before the reviewed period; however, it was mostly led by private institutions and was geared toward those who were planning to pursue higher education, thus such institutions usually offered courses of study required by universities: Latin, mathematics, literature, and science (McCormick, 1929). But as

the free and public secondary education became available to the majority of youth, it brought together students who were very diverse, and one of the prevailing beliefs among educators was that schools were responsible for efficiently preparing students for the future, providing an education that would enable students to join the workforce immediately upon graduation (Ravitch, 2000).

As schools were facing challenges of how to efficiently educate students who had distinct goals upon graduation, one solution they found was offering diversified curricula, thereby creating different paths to graduation (Kliebard, 2004). According to the recommendation of the High School Association of New York issued at the time of research for this work, the course selection prescribed to students should depend on the students' interests as well as on school alignment and the guidance of personnel. More specifically, in New York, *A Digest of the New York School Inquiry*, submitted to the New York Board of Education on July 17, 1913, noted that high schools should "print subcourses centering in some major subject and circulate them among pupils as suggested guides" (Bureau of Municipal Research, 1913, p. 57), and to "omit foreign language and mathematics in absolute prescription for graduation, but permit alternative choice of these two, or on advice by the principal, prescribe neither." (p. 57).

A movement demanding the elimination of some subjects and the differentiation of curriculum started to gain support, primarily in public high schools. Proponents of this movement claimed that curricula were too rigid and that students were needlessly forced into subjects that should be elective. In this context, William C. Bagley, a professor at Teachers College, in his work "Elective Subjects in the High-school Curriculum" (1908), discussed the value of the elective principle in high schools based on the responses received from principals of the largest high schools in the largest city of the state, principals of smaller high schools selected at random, and university professors. Bagley refers to the response from a university professor of education:

The American secondary school, in a large way, undertakes to provide useful education for various types of youths from fourteen to eighteen years of age. If the high school fully serves its purpose, it should carefully study the educational needs of the various possible groups of students which it is economically feasible for the school to distinguish. ... Now, the needs of these groups, whether culturally, socially, or vocationally, differ widely. Most of them ought to have English. Literature and compositions, though for some girls from cultured homes, the school at present can add nothing to their opportunities; ... a few (and only a few) should have algebra and geometry, more should have arithmetic, modified to their vocational needs. (p. 588)

The same professor, as quoted in Bagley (1908), posed the following question: "All over the United States, for example, girls are studying algebra and geometry, giving thereto a large part of their learning energy. Have we the slightest proof that in this case the results are worthwhile?" (p. 589). Thus, defense of the elective system relied on the needs of the students, which often was connected to the "needs of the local environment" (Bagley, 1908, p. 590).

In general, even though mathematics was still offered by the majority of high schools as part of the general education and still was required by universities as prerequisite, many schools in New York moved it to the list of electives students were able to choose³. In fact, the Committee on the Problem of Mathematics in Secondary Education, formed in 1911, was tasked with providing recommendations to teachers and school administrations for the high schools' mathematics curricula. The recommendations made by the committee in its report emphasized that high school mathematics curricula should be differentiated based on the needs of the student's vocation (U.S. Department of the Interior Bureau of Education, 1920). Pursuant to *High Schools of New York City: A Hand-book of Procedure and Personnel* (Jeffords & Walker, 1921) curriculum of many schools was based on the school's specialty:

The curriculum of any high school at any given time represents the individual interpretation given by that particular school to the general course of study prescribed by the Board of Education. Within those general limitations, each Principal is encouraged to develop details adapted to the specific character and problems of his school. The board provisions of the grouping plan of studies have encouraged local experiments in methods while conserving unity of aim and effort. The building of the curriculum for each school becomes an individual project by which the personality of the school and its teachers gives form and feature to the bare skeleton of the general prescription. (p. 25)

High Schools of New York City: A Hand-book of Procedure and Personnel (Jeffords & Walker, 1921), shows instances where these recommendations were gender specific. Washington Irving High School (girls only) and Bryant High School (coed) both offered "Girls' Technical Courses," and students who elected to take such courses could choose classes based on the following groups:

- Group I for stenography and typewriting
- Group II for dressmaking and embroidery
- Group III for millinery
- Group IV for design
- Group V for library work

Within these courses, commercial arithmetic was the only mathematics course prescribed for the first year, and no work in mathematics was prescribed beyond the first year except for the library assistant's course, which also required a course in plane geometry (Jeffords & Walker, 1921).

These developments in the public high schools became pivotal in the relationship of women's careers to their education. In the article "How Should Secondary Mathematics for Girls Differ From That for Boys?" Mary Adelle Evans (1914), teacher at William Penn High School for Girls in Philadelphia, Pennsylvania, wrote that discrimination in teaching does exist, but that "the

³ The usual courses included in progression in mathematics as part of a general education was as follows: arithmetic, algebra, plane geometry, solid geometry, and trigonometry.

discrimination is made not on account of sex but on account of dissimilar vocations” (p. 18). Indeed, with curricula becoming tightly connected to careers, which were presumed to be different for women and men, meeting the individual differences of students entailed enabling students to follow the different courses provided by the differentiated curricula. As Evans explained: “In lines of education where we are not bound by restrictions and requirements of higher institutions, we may differentiate secondary mathematics to the probable advantage of the student” (p. 18).

This finding was not unknown to the educators of the Progressive Era. The following excerpt from the bulletin *High Points in the Work of the High Schools of New York City* (New York Board of Education, 1921) reveals contemporary educators’ knowledge of the issue:

Now that mathematics has become an elective subject, we find that many girls have a tendency to leave it out of their programs. The word that mathematics is “hard” is passed on from one generation of students to the next, and it is only human nature that the girls should look for an “easy” subject to elect. (p. 12)

The same publications confirm that except for those who planned to go to college and those who were working for a state scholarship, girls were not required to take algebra classes, even if they had elected to study physics or chemistry. This put them at a disadvantage:

“All the girls say it is hard, so I guess I won’t take Algebra; I’ll take something easy.”

How often do we hear remarks similar to this? With no thought for the future, with no thought that teachers, principals, and superintendents who have planned the course of study to know more about the wisdom of it than a fifteen-year-old girl with no experience, a girl rejects a subject that is not only valuable in itself, but practically indispensable for some of her future work. We will leave out of the discussion the girl who is going to college and the girl who is working for a State Scholarship, for she has no choice in the matter; she must have Algebra. We will consider the girl who has heard that science is the subject of today and the future and decides that she will study science. How will she get along in the study of chemistry or physics? The working basis of chemistry is [an] equation, but if the pupil’s mind is a blank as to what an equation is, she will be all at sea in beginning chemistry. A woman of my acquaintance, a nurse, was taking a course in chemistry in Teachers College; she came to me for lessons in Algebra, which she had never studied, in order to enable her to understand the chemistry. In Physics there are those “terrible” formulas. If these seem difficult to a girl who has had Algebra, what must they be to one who has not? (New York Board of Education, 1921, p. 13)

Indeed, review of the mathematics classes (commercial and household arithmetic, algebra, geometry, intermediate algebra, and advanced algebra) in girls-only schools that stressed both college preparation and vocational education listed all mathematics courses as electives (Jeffords & Walker, 1921). Furthermore, according to the same source, in the girls-only Julia Richman High School, as of

1918, there were “eleven groups of subjects, generally similar to the groups in the High School of Commerce [boys-only school], except that mathematics is eliminated and domestic science is included” (Jeffords & Walker, 1921, p. 32).⁴

High School and the Job Market

The issue of female labor participation, as well as school enrollment, is important in comprehending changes that took place within high schools and in participation in mathematics courses. The female labor force expanded by 65% during the period under review, and the rate of expansion was most significant among young women. By the end of the 1930s, every fourth American in the labor force was a woman (Rury, 1991). At the same time, although the number of girls in coeducational high schools exceeded the number of boys (U.S. Bureau of Education, 1921), the proportion of girls who applied to college was significantly smaller than the proportion of boys. Less than a quarter of all applicants were girls.

The combination of the above-mentioned factors is essential to understanding the finding published in the *National Survey of Secondary Education in the United States* (U.S. Bureau of Education, 1933), which documented that girls tended to take a larger percentage of nonacademic subjects than boys and that boys surpassed girls in percentage of courses taken in mathematics and science. This finding indicates that curricula often were not selected from an academic perspective, but rather based on the career prospects that existed for girls during the period under review.

According to the 1910 U.S. Census, women were present in a wide variety of occupations. This finding seems positive; however, the same census shows that the majority of women were streamlined into a narrow path of options. Occupations such as bookkeeper, cashier, accountant, office clerk, and schoolteacher prevailed for women over the other possible categories of employment. A comparison of the number of women employed from 1910 to 1920 shows an increase in the number of clerical workers by 288.3%, stenographers and typists by 114.3%, bookkeepers and cashiers by 92.4%, store clerks by 46.6%, and teachers by 33.4% (U.S. Bureau of the Census, 1929). Moreover, the increase of men and women in these occupations was not proportional among the genders, and the Bureau of Municipal research reported a preponderance of females in clerical positions (Bureau of Municipal Research, 1913, p. 41).

Beyond the aspects of the reforms that took place in schools, review of the career opportunities for girls is incomplete without an examination of the occupational guidance that female students received from teachers, school administrators, parents, and peers as well as of the guidance found in the publications of the time. In order to analyze the guidance provided to female students in relation to future occupations, it is important to analyze printed materials of the period that contained vocational guidance for girls.

⁴ The boys-only Commercial High School required a course in arithmetic (1 unit), whereas algebra (1 unit) and geometry (1 unit) were electives.

A review of *Profitable Vocations for Girls* (Weaver, 1915) indicates that readers were encouraged to pursue a variety of professions. The jobs included were not limited to commercial careers only—they ranged from stenography, for its high demand and high income, to professional careers such as teacher, nurse, optometrist, physician, dentist, and pharmacist. However, the publication warns the reader that obtaining a professional degree comes with high tuition and extended studies. It is interesting to note that Weaver (1915) asked girls to “make a list of occupations in which persons may hope to succeed who are deficient in arithmetic; in geometry; in English” (p. 6).

One issue of the *Bulletin of High Points* (New York Board of Education, 1920) published an article titled “Occupational Guidance in Julia Richman High School.” The article acknowledged that due to the high dropout rate of students during the first year of high school, there was a need to offer a course that would help girls realize “first, the great advantage of a sound high school training; second, the need of adjustment of the individual girl to some occupation; third, the necessity for the careful study of the field of opportunities for girls” (p. 21). The topics studied in this course, according to the article, “were not chosen from an academic standpoint, but rather grew out of the immediate needs of the girls” (p. 21). Occupations reviewed in such courses were selected based on the “Help Wanted – Female” advertisements in the Sunday newspaper and with assistance from the Junior Employment Service, which was needed in order to show girls possibilities outside secretarial work because girls tended to select a career in secretarial work:

When the head of the employment agency tells [girls] that the requirements for the position of private secretary (of course, all the girls are convinced that they will be private secretaries when they leave high school) are very high and that only the girl with a rare character and personality succeeds, it functions much more than the advice of the mere pedagogue who is not supposed to have any business sense. (p. 22)

A review of the guidance girls received in terms of mathematics education should also include girls’ experiences outside school. Thus, the viewpoint of parents is important for a complete understanding of how the subject was perceived by girls in their daily life. In “How Should Secondary Mathematics for Girls Differ From That for Boys?” Evans (1914) recounts an interesting excerpt from a teacher’s interview with a father. In a discussion of the need for a secondary mathematics education for boys, the father was asked whether boys should be required to take algebra or geometry. He replied, “Yes. There is no business into which a high school boy may enter that will not be the better attended to by one who has had the mental discipline and training in logic and discrimination provided by the study of algebra and geometry” (p. 19). When the father was asked if girls should be required to take algebra or geometry, his attitude was not so well defined. For most girls, he advocated training in business arithmetic, and regarding girls who wanted more, he said, “Let those girls who wish it, study higher mathematics” (p. 19).

The above is not a reflection of all parents’ opinion on the need of a mathematics education for their daughters—parents’ points of view on their

children's education varied widely—but it does demonstrate that the purpose of mathematics education was often viewed as practical: boys needed to study mathematics, girls did not.

Lastly, *Careers for Women* (Feline, 1920) offered a compilation of articles by professionals to inform the reader what has been achieved by women in certain professions, thus expanding the reader's horizon not only to what was available, but also to what had been achieved, sometimes by pushing invisible boundaries. *Careers for Women* covers careers not usually found in the other reviewed publications on vocational guidance, and it includes a wide variety of writings by professionals who retell personal experiences in their careers. Through the compilation of these writings, Feline (1920) relayed to the reader that mathematics knowledge is needed for certain professions. For example, chapters on the careers of public accountant, geologist, architect, teacher, school principal, medical research worker, physicist, and psychologist all mention mathematics as one of the necessary skills. Feline also mentioned that many women are unprepared in mathematics.

In *Careers for Women* (Feline, 1920), Professor Margaret E. Maltby, Columbia University, states in the chapter "The Physicist," which she wrote, that women physicists are rare and that one of the reasons is as follows:

[F]ew women have the combination of a constructive imagination, the mechanical skill necessary for the successful investigator, the mastery of mathematics—an essential tool of the physicist—and application of a science that taxes the imagination and reasoning power and that is mathematical because it is exact. (p. 430)

This finding demonstrates that the relationship between the job market and mathematics education is not one-directional and also that it was more than only careers in demand which affected mathematics education for girls. Evidence found in *Careers for Women* (Feline, 1920) demonstrates that lack of women's preparation in mathematics affected the job market and prevented women from participation in the certain careers.

Teacher Training

The demand for differentiated education was absorbed by the high school education system. However, according to the report submitted to the New York Board of Education as part of *A Digest of the New York School Inquiry* (Bureau of Municipal Research, 1913), high schools were criticized for ineffective commercial education because "a considerable number of teachers" do not have proper training as commercial teachers and "have no other sympathies and use no other methods except those of an academic high school" (p. 40). Therefore, it is not surprising that educational programs of the time had started to develop courses the aim of which was to train teachers and vocational counselors to advise students on their future path. These courses were offered by Harvard University's summer school program in 1911, 1912, and 1913; by the University of California and the State Teachers' College in Greeley, Colorado, in 1914 and 1915; and at the time

that *Vocational Secondary Education* (Committee on Vocational Education and Vocational Guidance, 1916) was published, by the Teachers' College and Columbia University, in New York City.

Nor is it surprising that there was a need for teacher training to accommodate the growing demand for commercial subjects. Evidence of that is seen in the annual reports by the chair of the Hunter College mathematics department for the years 1915 through 1923, found in the college's archives. Hunter Normal College was one of the major teacher preparation schools in the New York City area.

A review of annual reports by the chair of the Hunter Normal College's mathematics department for the years 1915 through 1923 reveals changes in the approach to teacher training consequent with the new demands of the labor force.

Professor Emma Requa, chair of the Hunter Normal College mathematics department in 1916, presents the condition of the department for the year of 1915, stating the following:

The Association of Teachers of Mathematics in the Middle States and Maryland—its New York Section—and the Mathematics Section of the New York High School Teachers Association have given their almost undivided attention to the teaching of Commercial Algebra and Commercial Arithmetic in the high schools. The following optional has been introduced to keep in touch with this movement and the increased demands upon practical application of higher mathematics to the study of Political Science and to the training in financial affairs that every college student should receive: higher Mathematics applied to financial and industrial problems; application of series to interest computations; mathematical theory of investment; curves of efficiency; relations of corporations to stakeholders; schedules for accumulations of bond discounts; insurance; graph work showing the use of the exponential curve in securing wearing values; principles of building and loan associations: 3 periods; one-half year – 3 credits. (Hunter College of the City of New York, 1916, pp. 1–2)

The author continues by expressing her own point of view on the matter of commercial courses: "I do not consider that Mathematics is valuable only for its applications, but that it is worth a great deal in a general education to see what wide use is made of it" (Hunter College of the City of New York, 1916, p. 2).

In the *1917 Hunter Normal College Annual Report*, Requa writes that the mathematics courses offered by the mathematics department had been supplemented by the required courses in commercial subjects. The report also indicates that Hunter College implemented summer sessions and evening courses, whose aim it was to provide teachers with the appropriate training in commercial courses demanded by the high school curricula: "Many universities and colleges having been convinced of the value to the community, as well as to the individual, of such training have standardized commercial college courses" (Hunter College of the City of New York, 1917).

Six years later, in the *1923 Hunter Normal College Annual Report*, Requa states the following: "The recognition of the value of commercial training is universal. Almost every high school in this country furnishes [some] commercial course,

while others are purely commercial” (Hunter College of the City of New York, 1923, p. 3).

In fact, according to the *Biennial Survey of Education* (U.S. Bureau of Education, 1921), the integration of commercial education into vocational education became one of the most dominant topics in the minds of the administrators of secondary schools during the first decades of the 20th century.

Criticism

Developments associated with the rise of differentiated education and the popularization of commercial education within public schools were not passively accepted by all educators. The International Commission on the Teaching of Mathematics in its report *Mathematics in the Public and Private Secondary Schools of the United States* (1911) writes that the “life-career motive” of education leads to the aimlessness of education. “Altogether too many pupils have no dominant purpose that might keep them at work. A moderate vocational tendency may prove a partial remedy, although it would be a grievous mistake to make vocational studies the sole basis of our secondary education” (p. 103).

Bagley, in his work “Elective Subjects in the High-school Curriculum” (1908), presented arguments received from educators against the elective principle, including:

“Pupils of high-school age cannot be trusted to choose their subjects wisely” (p. 590).

“The elective principle tends unduly to ‘soften’ the curriculum” (p. 590).

“The principle of election assumes that all subjects of study are of equal educative value. ... Some subjects seem inherently to be more difficult than others: they deal with abstract conceptions that demand closer and more sustained attention. The numerous researches upon fatigue seem unquestionably to have established this principle” (p. 592).

“The unrestricted application of the principle of election makes an illogical and incoherent course” (p. 592).

“[The elective principle encourages] flitting about from one department to another, [which can often lead to a] disastrous desire for change and variety” (p. 592).

Criticism of public education geared toward matching demands of the job market is also found in media outlets of the time. On June 12, 1915, Henrietta Rodman, a New York City high school teacher, published an article in the *New York Tribune* in which she quotes Maud Thompson, secretary of the Socialist Committee on Education, who said:

It is not the school’s business to fit a child to meet an employer’s demands, but the school should teach the main facts and processes of industry, so that he will know what he is going into. Teaching a particular trade is dangerous, because the conditions of industry are constantly changing. The boy or girl needs to know fundamental processes and types of machines so that he or she may be able to pass from one machine to another and not stand ignorant

and helpless when the old machine is taken out and the new one put in. It is the first duty of the public schools to fit the children for the lives that most of them will live. But they must be taught how to enjoy their leisure. (Rodman, 1915)

According to Rodman (1915), one of the changes demanded by Thomson was retention of cultural studies—music, literature, drama, art, languages, and sciences—for all students. Rodman also presents Thomson’s list of the dangers that threaten the children of lower socioeconomic classes:

- “Making good machine tenders instead of educated men and women
- “Attempting to adapt the child to the complex processes of present-day industry by the use of machine methods and sub-division of work in the schools, thereby disregarding his physical, mental, and emotional needs
- “Making the product an end for the sake of profit, instead of a means of education
- “Selling the products of the children’s work in open market for less than market prices
- “Teaching a trade in the elementary schools before the child is mature enough to choose his vocation
- “Depriving the children of the workers of the culture, which alone can make a life of monotonous toil endurable
- “Deepening the gulf between the privileged and unprivileged classes by providing at public expense two kinds of education in grades, one for the children of the workers and another for those whose parents can afford to send them to high school and college
- “Allowing employees’ organizations to control in any way the educational policy” (p. 7)

Not only was Rodman a teacher at Wadleigh High School, public high school for girls located in New York City, but also, she became a nationally known spokesperson for women’s education, with the vision that women’s education should lead to a greater variety of employment. Rodman believed that education should allow for “mothers [who] would work outside the home, not simply out of dire necessity, but also for intrinsic satisfaction” (Carter, 2017, p. 124).

Within school walls, the opinion of the educators and administrations of commercial education was also expressed as restrictive toward the fulfillment of limited roles in the job market. According to a report submitted to the New York Board of Education as part of *A Digest of the New York School Inquiry* (Bureau of Municipal Research, 1913), “[The] usual testimony of principals of general high schools is that commercial pupils constitute a less desirable element of the school; because commercial education does not offer opportunities in energizing occupations” (p. 40). Furthermore, studies of business organizations done by the New York and Boston Chambers of Commerce show that the shift from clerical departments to other departments is rare.

The effects of eliminating algebra and geometry from the curriculum or reducing offerings in these subjects in order to free up time for subjects aligned

with life-career interests were addressed by the experiment presented in “An Arithmetic Test in Three Philadelphia High Schools” (Rorer, 1911), which was published in the journal *Mathematics Teacher*. The work presents the details of an experiment focused on the need to prepare students for the common arithmetic processes required for accounting and secretarial work. The experiment was performed with three schools, school A, school B, and school C. Only arithmetic questions were given to 100 students from each of the four high school grades and each of the three schools.

School A was a boys’ school, and according to Rorer (1911):

The boys tested were almost exclusively in the classical and scientific courses, their mathematics being algebra, geometry, algebra continued, and trigonometry. In addition, two commercial course sections were tested. These were fourth-year boys who had been drilled in commercial arithmetic during their second year, but whose training in algebra and geometry was less than half that of classical and scientific students. (p. 187)

According to the experiment, the average performance of the boys who were taking commercial arithmetic was slightly lower than that of the boys who were enrolled in classical and scientific studies.

However, what is more interesting is that although students from school B, a girls’ school, had instruction in the first year in algebra, in the following three years, they studied commercial arithmetic. And in school C, also a girls’ school, students studied algebra and geometry during the first three years of high school and arithmetic in the fourth year. Rorer (1911) stated:

In school B, the girls of the fourth year who had received two hours per week instruction in arithmetic for one year more did not do so well; while in school C, it would seem that the girls are more accurate in such elementary calculation before receiving high school instruction in arithmetic than they are after receiving it. ... The study of high school mathematics, not exclusively arithmetic, [but also] algebra, geometry, trigonometry, does not interfere with facility in simple commercial calculation but, on the other hand, increases the ability of the students in accuracy and speed. (p. 188)

This experiment showed that studying algebra, geometry, and trigonometry does not take away from the ability of students to perform the mathematics required for a commercial career and, in fact, proved that studying those subjects improves students’ arithmetic skills, needed for careers in the commercial fields.

Conclusion

This research reviews the impact of regional economies, social conditions, and labor market demands on mathematics education in public high schools during the early 20th century. Schools responded to students’ diverse needs by adopting diversified curricula, including mathematics, which aimed to align to the labor market shifts. Though not undisputed, a prevailing belief among educators and influential leaders was that girls required a different education path and that mathematics should be an elective subject for them. This belief was influenced by

societal expectations, gender-related norms, and students' perceived career choices. Consequently, alternative courses considered more relevant to girls' future needs were offered instead of traditional algebra and geometry classes. Although women gained increased access to high school education during this period, it did not necessarily lead to upward mobility. Instead, it often limited their opportunities to basic clerical training, aligning them with the growing job market but restricting access to other career paths. This research contributes to a more comprehensive understanding of the intersection between vocational curriculum as part of secondary education, mathematics education, and gender-related experiences in schools, prompting future exploration of the resulting educational practices and policies.

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