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SOCIAL MATHEMATICS IN THE CURRICULUM OF AMERICAN CIVICS: AN ANALYSIS OF SELECTED NATIONAL AND STATE STANDARDS AND OF MAGRUDER'S AMERICAN GOVERNMENT

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ABSTRACT

Social Mathematics in the Curriculum of American Civics

Social mathematics has enjoyed over twenty-five years of representation in social studies education literature. To better understand the development of *social mathematics* and how it relates to social studies education, historical research was conducted in order to determine the ways in which mathematics and statistics pertain to social studies education. A new definition of *social mathematics* is presented, one that is based upon the historical and contemporary review of the ways in which historical and contemporary theorists and practitioners conceptualize the intersection of mathematics, statistics, and civics.

Descriptive research methodologies are also employed in order to analyze the treatment of social mathematics within the curriculum of American Civics. Representative samples of civic curricula were identified at the national, state, and textbook levels. The official texts of all samples were analyzed regarding their treatment of social mathematics. Results indicate that national social studies and civics standards at best imply the importance of social mathematics, state social studies standards treat social mathematics marginally, and the textbook selected for analysis offers primarily practice and assessment in rudimentary skills of social mathematics.

Several conclusions are offered to account for the lack of representation of *social mathematics* in the civics curriculum. Additionally, numerous examples are provided of how national and state education agencies and textbook publishers can address social mathematics within the civics curriculum and why students of American Civics need instruction in and practice with the concepts and skills of *social mathematics*.

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Chapter 1

The Case For Social Mathematics

> The primary goal of social studies continues to be to prepare students to be informed citizens by introducing them to the structure, concepts, and skills of the social science disciplines. This goal can be met with greater success and a higher level of sophistication of (sic) students have opportunities to learn and use more statistical analysis in making personal and social decisions. Various statistical procedures have become important and will continue to be valuable lifelong social studies skills.
>
> -Hartoonian, et al, 1991, p. 75

This study is a historical and contemporary examination of the recognition on the part of the field of social studies education of the importance of mathematics and statistics in civic education. This integration of civic instruction with instruction in appropriate aspects of mathematics and statistics is known in the social studies education community as *social mathematics* (Hartoonian et. al., 1989). This study demonstrates that there exists over eighty years of evidence to suggest that many have consistently called for instruction in social mathematics. Ultimately, this study seeks to answer the question of how these calls for instruction in social mathematics are represented in the current curricula of civics – in national standards, state standards, and nationally marketed textbooks.

Some argue (Hartoonian, Laughlin, & Sanders, 1989; Paulos, 1995; Steen 1990) that a basic understanding of mathematics and statistics, as well as knowledge of how they can be used and abused, is an important component of a twenty-first century American education, and that this knowledge is crucial for both individual and social survival in and of a democracy. In this study, I examine how this argument has been represented in the curricula of civics education. To this end, I provide an historical review of the call for social mathematics, an analysis of a selection of the national and state standards concerning this topic, and a survey of the content of the leading nationally published civics textbook series. For this study, I have defined social mathematics as:

> *A construct of the social studies that combines instruction in the use of certain mathematical and statistical terms, concepts, and skills (e.g., probability, sampling, dispersion, mean, median, mode) with realistic and practical applications of these terms, concepts, and skills to common daily civic activities (e.g., making sense of a newspaper story, analyzing the evidence presented in support of policy, or deciding if one supports social security reform). Social mathematics includes instruction and realistic practice in recognizing, collecting, measuring, judging, and analyzing information presented numerically, recognizing conclusions drawn from data that are faulty, and communicating mathematical and statistical evidence and conclusions to others.*

This revised definition of social mathematics is a result of an analysis of over one hundred and fifty years of literature on civic education, as detailed in the second chapter of this study. I assume the aforementioned stance on curricular study because decades of research suggest that the standards and textbooks of any given discipline largely direct the content of that discipline. The discipline of civics education is no different.

More recently, much has been written about how large textbook adoption states like California and Texas drive the content of school texts. In the civics text market, publishing giant Prentice Hall, a division of Pearson Education, claims that their text *Magruder's American Government* has consistently held at least 70% of the civics and government textbook market since it first appeared in 1917 (Walker, 2002). How can one civics textbook so thoroughly dominate the American market? One of the reasons why one textbook can command a majority position in overall sales is due in no small part to states with statewide textbook adoption policies. In the December 2000 issue of the *American School Board Journal*, senior editor Rebecca Jones wrote that:

> Driving the [textbook] market are four key states – California, Texas, Florida, and North Carolina – that provide state funding for texts approved by their textbook-adoption committees. Together, these states accounted for $971 million of the $3.3 billion in U.S. textbook sales in 1998, the most recent year for which sales figures are available. (p. 4)

This information more than subtly suggests that textbook adoption states that serve a large student population influence the content of those texts. In the case of civics education, are activities, assignments, and projects involving social mathematics present in those texts used by some of the largest textbook adoption states? Are those same activities, assignments, and projects aligned with state and national standards?

Why Social Mathematics Is An Important Part Of A Civic Education

Human history records our struggles to make sense of the world around us – first through gathering information and then analyzing that information to seek patterns and to ultimately draw inferences. The last three centuries witnessed a dramatic growth in both the amount of information quantified and the number of ways information was interpreted and used (Cohen, 1999, 2001 and 2003; Orrill, 2001; Porter, 1997; Steen, 1997 and 2001). As these processes became more sophisticated, broadsides, tables, charts, books, graphs, and thousands of other forms of information repositories were created to store, retrieve, analyze, and present data for public and private consumption. This astonishing development of information quantification pales in comparison to what has taken place over the past three decades. An unprecedented accelerated information evolution has unfolded, largely the result of computers that have grown exponentially in power while falling dramatically in price. Indeed, no system for such collection, in all of human history, has excelled the speed, capacity, power, flexibility and complexity of the modern computer (Porter, 1997).

Two hundred years ago, meticulously trained ciphers and recorders labored a lifetime to collect and organize data for the extremely privileged few. The ordinary American citizen of today has access to a voluminous amount of data, the likes of which were incomprehensible to the scribes of human history (Porter, 1997). It is not only a matter of access; computers have also provided users with sophisticated and powerful tools to help manage data. "Every desktop computer," wrote mathematician Lynn Steen in 1997, "includes spreadsheet software more powerful than programs available to professional accountants twenty years ago. No longer is the calculation of car loans or mortgage rates an esoteric specialty known only to bankers. Now all numerate citizens may determine for themselves the economic impact of their own decisions, and of the decisions of their elected officials are making on their behalf" (p. xvi). This unprecedented access to incalculable amounts of data (all with literally a touch of a finger) presents one of the most compelling democratic dramas of our time: *Will our age become one in which Americans intelligently consume numeric and statistical information for such things as making informed choices in the voting booth or weighing the validity of polls, or will our age be recorded as one in which we are increasingly taken advantage of by charlatans of business, politics, and the media because of our mathematical and statistical ignorance?*

The Link Between Numbers and Democracy

There is decidedly a historical link between numbers, citizens, and the state that goes beyond an ability to access, collect, manage, store, retrieve, manipulate, and represent numerical and statistical information. In his essay *The Triumph of Numbers*, historian Theodore M. Porter argued that numbers actually served to spread democracy by promoting a new form of "openness" as a result of the process of quantification (1997). As early as the eighteenth century, most European countries established some form of rudimentary census and the information garnered from these early instruments was considered state secrets to be used by the governing body that commissioned the study. As census information grew more detailed, statisticians were employed to both record and bring meaning to the data (interestingly, the word *statistician* and thus *statistics* is derived from the Latin word *status*, or state (Barnhart, 1947)). By the nineteenth century, Porter (1997) asserts, these statisticians prided themselves as servants of the public interest and of democracy. This unprecedented quantification (and no less important the publication) of so much political and social data caused a dramatic shift in how government, as well as elected or appointed officials, functioned. Once able to operate under the cloak afforded them by a citizenry denied access to economic, political, and demographic data, these same officials now found themselves judged by a citizenry newly equipped with information – often in quantified form – and in many cases, newly equipped with the right to vote.

Though Porter's assertion clearly and accurately establishes a link between data, data manipulation, data analysis, and publication of data for public consumption, it is also illustrative of the link between a democratic society and a literate citizenry – in this case, a citizenry that is *quantitatively* or *statistically* literate in addition to possessing the skills of reading and writing. Just as Steen articulates concern for democracy in the face of innumerate citizenry, Porter warns, “The gap between the massive reliance on quantitative methods in business and government and the very limited numeracy of the wider public shifts the balance of authority away from democracy and toward a kind of technocracy” (1997, p.8). As numbers and statistics are increasingly used to make meaning, present and support positions, defend actions taken or not taken, and to convince people to *do something* (the list goes on), power shifts to those who understand and can manipulate numbers.

Mathematicians and mathematics educators can be credited with recent attempts to draw a connection between mathematical and statistical knowledge and social, economic, and political power. Some see a direct relationship between the health of a democracy and the mathematical or *quantitative literacy* of its people. A number of mathematicians (Ellis, 1942; Forman & Steen, 1949; Kennedy, 2001; Paulos, 1988; and Steen, 1990) have written convincing and well-reasoned arguments that verbal literacy is no longer enough to protect oneself from fraud and abuse. Their message is compelling: An American citizenry that fails to understand how statistical information is both used and abused by the media as well as private and public organizations is at economic, legal, political, and personal risk. “As information becomes ever more quantitative and as society relies increasingly on computers and the data they produce, an innumerate citizen today,” warns Steen, “is as vulnerable as the illiterate peasant of Gutenberg’s time” (1997, p. xv). The citizens of twenty-first century America will need to equip themselves with greater numeric and statistical knowledge if they do not want to become the modern equivalent of an illiterate peasant.

The idea that a *fluency* in, and skill with, mathematical and statistical operations as they apply to social data and information fits neatly with the value of a literate and informed citizenry. There is a link between being quantitatively literate and democracy, just as there exists a link between democracy and what most people have come to understand as literate. Thomas Jefferson vehemently argued for a republic filled with a literate citizenry to ensure the welfare of the republic. “Educate and inform the whole mass of the people,” he wrote to James Madison in 1787, “Enable them to see that it is in their interest to preserve peace and order, and they will preserve them. They are the only sure reliance for the preservation of our liberty” (Koch and Peden, 1998, p. 407). The preservation of eighteenth century American democracy, as Thomas Jefferson believed, may have indeed relied on a verbally literate citizenry. The preservation of a twenty-first century American democracy may equally rely on a citizenry that is also statistically literate.

The Role Of Civic Education

Writing of the need to teach Americans to be more literate in the language of mathematics, Steen wrote that “In terms of what is needed for active and alert participation in contemporary society, quantitative literacy can be viewed as a direct analog of verbal literacy”(2001, p. 9). This analogy between the two literacies forms the core argument for why mathematical and statistical ideas, concepts, and skills should be reflected in contemporary civics education. The ability to read and write shifted *some* power away from eighteenth and nineteenth governments and into the hands of a literate population. It is easy to recognize, however, that skilled wordsmiths could still construct sentences and craft arguments that could be *read* by the general public, but not necessarily *understood* by the readership. The same can be said for quantitative literacy.

Some may rightfully argue that students of the secondary grades in American public and private schools already take courses in algebra, calculus, geometry, and statistics. Why is it necessary to "repeat" mathematical instruction in a civics course? For the same reason that literate people can still be mislead and duped by the letters and words they can understand. In both verbal and quantitative literacy, context is a critical component in making sense of what is in front of the reader. This may serve to explain why some mathematicians (Schoenfeld, 2001; Kennedy, 2001) argue that mathematics class is *not* the appropriate place to teach students how mathematics and statistics can be used and abused, largely because the texts, homework, and activities are based so much on abstract concepts and ideas. Civics class can be a unique place to discuss and learn about numbers and statistics because an astonishing number of current and historical social, economic, and political events are based in some form on polls, elections, measurement, tabulation, percentages, ratios, means, averages, statistical modeling – the list continues.

Steen's (1990) analogy between verbal and quantitative literacy is also crucial in forming the core argument for why mathematical and statistical ideas, concepts, and skills should be reflected in contemporary civics education.   Steen's analogy alludes to the fact that numbers, just like words, are not impartial. Statistics is not a privileged language of understanding, meaning making, impartiality, or of "truth". The "language" of statistics is not unlike more familiar textual language in that numbers, just like words, can distort or misrepresent information. In one way, statistics and information represented numerically may actually present a *greater* danger to the average citizen because numerical information seems to be consumed by the general public with much less skepticism and questioning, *as if numbers are both impartial and effectively and accurately represent the truth.* Understanding numerical information and statistics becomes an imperative of civics education when one considers the explosive growth of information represented numerically or statistically via the national media and other public and private sources of information. Statistics can serve as another way of making meaning, another way of corroborating or refuting information and conclusions, another way of generating important civic questions, and another way of interpreting and understanding for the student of the social studies. It is another important tool for the twenty-first century American citizen to take in hand.

There are reasons other than providing context for including mathematical and statistical concepts and skills in social studies in general and civics in particular. If one believes that one of the goals of civic education is to equip the nation's students with the skills, knowledge, and content necessary to become an active participant in a representative democracy, then including instruction and activities that enhance student understanding of statistics is fully compatible with, and complimentary to, this notion of teaching students to be active and informed citizens. The choice of the words *compatible* and *complimentary* are purposeful; the idea of teaching students of the social studies to be better consumers of numerical and statistical information is not to suggest that such instruction should come at the expense of teaching more traditional forms of civics and citizenship content and skills. Rather, it is an argument for helping students of the social studies to interpret information, analyze and judge evidence, and make informed decisions, three very traditional skills associated with civic education. The ability to interpret information, to judge and analyze evidence, and to make informed decisions in twenty-first century America requires that students and teachers of the social studies understand that the information we consume via the print, television, and electronic media is increasingly presented to us in mathematical and statistical form. Any level of statistical or mathematical illiteracy on the part of the American citizen leaves him or her at a significant disadvantage when it comes to applying these skills of citizenship.

There are also those that make the persuasive argument that learning about statistics and mathematics is an important part of civics because it can serve to open more doors of opportunity for our nation's youth. Social studies educators *can* reach the student turned off by mathematics, algebra, and statistics by examining those same areas within the context of the social studies. Is this not another way of teaching civics, inspiring our nation's youth to open doors of opportunities closed to some for generations? In *Radical Equations* (2001), civil rights leader Robert Moses draws many comparisons between his work in Mississippi in the 1960s to teaching kids about the importance of math:

> Today, I want to argue, the most urgent social issue affecting poor people and people of color is economic access. In today's world, economic access and full citizenship depend crucially on math and science literacy. I believe that math literacy in urban and rural communities throughout this country is an issue as urgent as the lack of registered Black voters in Mississippi was in 1961. (p. 5)

The argument for including statistics in civics, then, becomes one that is two-fold. First, students of civics need to understand the mathematics and statistics behind so much of the ever-increasing numerical data and information presented to them via the media outlets and private and public sources of information. These fantastic increases in both the amount of information available and ability to access this information is only meaningful and useful to an American citizenry if the information is fully *understood* by the reader. Citizens will need to learn to be comfortable with social, economic, political, legal, personal, professional, and health-related information presented in increasingly statistical formats. Citizens will also need to learn how to use and intelligently consume this information in a variety of "everyday" contexts. Second, embracing the statistical aspects of social data and information equips students with another skill that can potentially provide them with the kinds of access they desperately need – access not only to jobs, but to economic, social, educational, and political opportunities as well.

Statement Of The Problem

A basic understanding of mathematics and statistics, as well as a knowledge of how numbers and statistics can be used and abused by governmental, public, and private entities are important components of a twenty-first century American education. I argue that such knowledge and understanding is not only critical for the survival and success of the individual, but also critical to the survival and success of our representative democracy. Numbers, mathematical operations, and statistics are increasingly identified as requisite skills for current and future citizens who want to both fully participate in modern American society and protect themselves against those public and private entities that use or misuse numerical and statistical data.

The following chapter will provide the reader with ample historical evidence that suggests that the claims posited in this chapter have evolved from nearly a century of consistent calls for instruction in social mathematics. Given our ever increasing reliance on and exposure to numbers and statistics in modern American society, do civics texts and standards support the notion that "ordinary citizens" need to have a basic knowledge and understanding of social mathematics? This study ultimately will answer the following problem: *How are the calls for social mathematics represented in the* ***current*** *curricula of civics – national standards, state standards, and a nationally marketed civics textbook?*

A Brief Overview Of The Content Of This Study

The first chapter of this study has provided the reader with an introduction to, and a definition of, social mathematics. I also included a rationale for the study and a statement of the problem to be studied. In chapter two I review over one hundred years of literature on civic education. I identify several terms, used throughout the last century, that are analogous to social mathematics. I defend my choices in my definition of social mathematics, explaining how I culled the most useful parts of various positions to develop a viable tool for analyzing national and state standards and a nationally marketed civics text. In the third chapter I detail the methodologies employed in this study, and I explain and defend my choices concerning the selection of national standards, state standards, and the text to be analyzed. In addition, I present a listing of the concepts and skills of social mathematics, as well as a description and purpose of the social mathematics rubric to be used to judge the quality of examples of social mathematics identified in national standards, state standards, and a nationally marketed civics text.

The fourth chapter provides a detailed analysis of the national standards in social studies and in civics education. The fifth chapter provides a detailed analysis of the state social studies standards of California, Florida, and Texas. The sixth chapter provides a detailed analysis of a nationally marketed civics textbook, *Magruder's American Government*. The seventh and final chapter presents an overall analysis and several results concerning the initial question of how social mathematics is represented in the current curricula of civics education. As a result of the analyses, conclusions, and results obtained in this study, several recommendations are made regarding the inclusion of social mathematics in all levels of the civics curriculum.

Chapter 2

Developing a Statistically Literate Citizenry: A Brief History of Statistics as a Necessary Skill Of A Civic Education

> Governments do indeed derive their just powers from the consent of the governed and in that assumption, so fundamental to our democratic way of life, there is a further assumption that our citizens know how to evaluate the forces which operate in a free society, and that their final judgments are the result of sound methods of thought. Does it stretch the imagination to believe that mathematics is an instrument which can be used to improve the quality of those judgments?
>
> - Fawcett, 1947, p. 203

There are several fundamental and important questions that can be addressed in an historical examination of how some educators interpret the role that mathematics and statistics should play in a civic education. How have civic educators and mathematics educators used content, ideas, and skills of the "other" discipline? Does there exist some agreement and commonality among civics and mathematics educators in regard to which concepts and skills should be taught to students of civics? Have the concepts and skills of mathematics and statistics as they apply to civic education changed over the years, or have they remained constant? Can the definitions of social mathematics offered by social studies and mathematics educators be synthesized to yield a more descriptive and useful definition of social mathematics?

Before turning to these and other questions, it is important to provide a brief overview of how this literature review was conducted. The first step involved consulting a number of well-established and recognized publications in the fields of social studies and mathematics education that span the last one hundred and fifty years. A hand search was conducted through each volume's table of contents or index to determine if there were articles in which the author(s) wrote of content and/or skills of civics and mathematics within the same article. In order to glean as many examples as possible, a variety of search terms were employed, including (but not limited to) citizenship, civics, political science, civil government, political arithmetic, social studies, social science, democracy, democracy education, government, mathematics, arithmetic, statistics, numeracy, and quantitative literacy.

To be sure, there exist more overt examples of mathematical correlation with other disciplines of the social studies. Perhaps the most prominent examples occur in economics, geography, consumer education, and the social sciences. Many economic principles are based on probability and mathematical modeling; geography encompasses longitude, latitude, measurements of climate, and global positioning; consumer education prepares students in everything from balancing a checkbook to creating a family budget; and the social sciences embrace complex statistical programs to make sense of research data. *Why focus upon civics education and not upon the uses of mathematics and statistics in economics, geography, consumer education, and the social sciences?* Because a host of mathematicians, mathematics educators, and social studies educators, (as detailed in the previous chapter), have developed persuasive arguments that underscore the need for *all* citizens to become more mathematically and statistically literate in the larger context of intelligently consuming information. It is reasonable to conclude that if their positions were to be realized in our nation's schools, it would be within courses such as *civics, citizenship, problems of democracy, American government,* and *political science*. It is also reasonable to expect that, if national and state governments and organizations believe that incorporating more mathematical and statistical study into civics courses is an important step towards developing more competent citizens, that it is within these courses that such integration and correlation are to be found.

These course titles (and often textbook titles) – *civics*, *citizenship*, *problems of democracy*, *American government*, and *political science* – reflect the various terms used historically and contemporarily by authors, national and state organizations, and school districts to describe course that generally provide civic instruction. This seemingly confusing situation derives from historical changes in preferred nomenclature. I have endeavored to retain the original nomenclature used by the authors and agencies referred to throughout this study. The terms *civics* or *civic education* is used throughout this body of work when an author or agency has not used a different term, or in general descriptive narrative. The terms *civics* or *civic education* are encapsulated by the description offered in the *National Standards for Civics and Government* (1994) as to what civic instruction should entail:

> Formal instruction in civics and government should provide students with a basic understanding of civic life, politics, and government. It should help them understand the workings of their own and other political systems as well as the relationship of American politics and government to world affairs. Formal instruction provides a basis for understanding the rights and responsibilities of citizens in American constitutional democracy and a framework for competent and responsible participation…Civics and government should be seen as a discipline equal to others. Civics and government, like history and geography, is an interdisciplinary subject whose substance is drawn form the disciplines of political science, political philosophy, history, economics, and jurisprudence. In

> sum, civic education should not be considered incidental to the schooling of American youth. Civic education instead should be considered central to the purposes of American education and essential to the well being of American democracy. (pp. 1-2)

The decisions made concerning this particular literature review, and indeed a number of decisions concerning the focus of this entire study, were predicated on the written arguments of a number of contemporary mathematicians, statisticians, and mathematics educators. One of the critical questions that guided this review of the literature was, "Given that a number of mathematicians, statisticians, and mathematics educators vehemently argue for and support mathematical and statistical instruction *in courses that prepare students to become American citizens* (as opposed to arguing for more mathematics and statistics courses), how does the curricula of civics represent this current and historical call?"

The Nature of American Civic Education, 1850-1900

The *social studies*, at least as most educators understand them to signify today, did not exist as a cohesive formal course of study in American schools of the nineteenth century. That is not to say, however, that there did not exist courses called *Civics*. Nearly fifty years before the first widespread use of the term *social studies* (Page, 1992), C.F. Crehore (1866) wrote of civic instruction in the common school:

> Having been taught that it is the duty of a citizen to recognize and submit to existing laws, the students must be further taught what those laws are and why they exist – in other words, their history; for it is not only his duty to obey them,

> but also not infrequently to vote upon their repeal or revision, or the framing of others. (p. 265)

An examination of the education-related journals of the late nineteenth century reveal some commonality in topics covered amongst courses offered in civics (Harley, 1892; MacKibbin, 1890; Missimer, 1889; Mowry, 1887; Vose, 1887). Students were expected to:

1. Learn how the American government operates.
2. Learn the laws and rights afforded to Americans.
3. Learn how to live as a member of American society.
4. Read and memorize parts or all of the United States Constitution.
5. Memorize selections from the Declaration of Independence, the Articles of Confederation, the Ordinance of 1787, and other historic documents at the discretion of the teacher.

What was a course in civics like during this time? Stuart MacKibben, superintendent of schools in Petoskey, Michigan, offered his own observations via his 1890 article entitled, “Preparation for Citizenship in Michigan”:

> Civil government is in these high schools, like history, assigned to the weaker teachers, and not considered of much consequence. The quality of instruction is about what might be expected. A certain number of pages of the text book is assigned for the next lesson, studied by the pupil, and at a time of recitation recited, either as a voluntary repetition or reproduction of the textbook, or in fragments in response to questions from the teacher, sitting book in hand. Other teachers assign topics, and draw elaborate outlines on the blackboard, to be studied up in the textbook. The whole work is cut and dried, purely formal and perfunctory. There is none of that original work that research, that examination of authorities, that free and independent discussion for which Civil Government

> offers the most fruitful field. If, by chance, any question outside the limits of the book arises in the class, recourse is had to some other textbook with which the teacher may chance to have, or failing here, to some good-natured lawyer. There are exceptions to this style of teaching Civil Government in our high schools, but the exceptions prove the rule. (pp. 409-10)

Civics courses offered by some colleges and universities during the last quarter of the nineteenth century encompassed a broader curriculum than their high school counterparts, but one wonders just how much college and university teaching methods differed from those described by MacKibben. Articles written by representatives from Harvard University, Williams College, Amherst, Smith, and Wellesley outlined the subject areas part of a "civic education" at these leading institutions (Hart, 1888; Perry, 1889; Morse, 1888; Clark, 1889; Coman, 1890, respectively)

1. Constitutional law (The United States Constitution served as the textbook)
2. Comparisons between world governments (when examples were provided, a comparison between the French and American governments was cited).
3. Political debate tactics.
4. Individual historical research projects
5. American history
6. Political and constitutional history of the United States.
7. Political economy
8. Ancient and modern European history
9. Greek history

In addition to the subject areas listed above, the college and university students of civics were instructed to establish college senates where none existed, participate in college and university senates where such organizations did exist, participate in *citizenship fraternities*, and practice oration and *moral science* (ethics).

Two aspects of the subject areas to be studied by college or university students enrolled in civics at the institutions of higher learning listed in the preceding paragraph may at first seem unusual. The first is the inclusion of so much American and European history. The second is *political debate tactics*, not so much because it seems out of place in what some may assume to have taken place on a college or university campus in the late nineteenth century, but because such a course of study might reveal some early roots of the inclusion and use of evidence based in some part on statistical or mathematical arguments to make a point in a debate.

So much time and study was devoted to history, it turns out, because it was widely assumed by many in higher education that historical study was a requisite of civics. Study of the United States Constitution, constitutional history, ancient Greece, and the history of political development in European countries were understood to be foundations of American civics, and therefore were requisite subjects. Additionally, the emergence of the American History Association in 1884 and the professionalization of the discipline were likely catalysts for increased attention to historical study (Boozer, 1960; Lagerman, 2000).

The earliest roots of the inclusion of statistics or mathematical arguments are also not to be found in the "debate tactics" of Victorian America. Although the inclusion of debates within the college and university civics curriculum might have provided an instructional respite from the recitation and lecture method of teaching, there is little evidence to suggest that these debates required or even encouraged students to bring statistical evidence into the debate. Evidence cited to support a position offered in a debate was not necessarily evidence based upon logical thinking or statistical analysis of data – "evidence" was what was believed to be moral, right, and just. Writing in 1892, W.S. Harley cajoled educators to:

> Let the boys of this country be led to see that there is a right and a wrong side to every question that comes up, and that the right deserves to be supported, whatever the name of the party advocating it. (pp. 18-9)

As the nineteenth century drew to a close, the subjects offered under the umbrella of civics education changed little, with a few notable exceptions. In an 1887 report to the annual meeting of the Massachusetts Council of the American Instruction of Civics, chairman William Mowry presented a document entitled "Courses of Study in Civics For Schools and Higher Institutions of Learning". Mowry's paper grew from a study he undertook in the previous year of all the courses offered in the high schools of Massachusetts that could be "…embraced under the comprehensive word civics" (p. 86). The courses were typical of the offerings noted by other authors of the day, with two notable exceptions. The first involved some Massachusetts high schools that were forming a single civics class or the entire school into a sort of convention – following established procedural rules of parliament and having students role play the constitutional convention or a period in the state senate or the United States Congress.

The other notable addition to the familiar list of topics of civics was the inclusion of the reading of daily newspapers. Here again, it is tempting to believe that the earliest roots of a conjoining of statistics and civics are to be found, but there simply exists no evidence to support such a claim. While it is true that courses in civics in the late nineteenth century increasingly walked a fine line between requiring students to be familiar with current events and tactics of political debate, Victorian sensibilities of the day placed a moral premium on the “right” and “wrong” of an issue and in one’s ability to wage a decidedly non-quantitative argument to convince an opponent of the “rightness” of a position.

Much of the educational literature of the day devoted to civics still centered on having students memorize and recite key texts of American political history such as The Declaration of Independence and the United States Constitution. This reality is not surprising when one considers that civics of the nineteenth century was largely understood to be an attempt to indoctrinate millions of recent immigrants to the political, legal, economic, and social “workings” of America (Best, 1960; Kliebard, 1995). This reality is also not surprising given the nature of teaching and learning in nineteenth century America. Herbert Kliebard perhaps describes this nature the best when he writes, “In terms of the curriculum, the status quo was represented by the standard academic subjects such as history, geography, English, mathematics, science and foreign languages. In terms of teaching, the status quo overwhelmingly took the form of the recitation method…” (2002, p. 3).

Increasingly, however, more frequent calls were made for debate, mock senates, mock trials, and the reading of newspapers. These movements were likely the result of pedagogical trends and changes and signaled a slight change in what was being taught, or perhaps more precisely, the way civics would be taught. Less vocal were those who previously advocated for memorization and recitation of texts and facts. The goal of instruction in civics, similar to the instructional goals of other disciplines, was to engage the student more and make civics more practical to every day life.

Scientific Thinking of 1880-1900

There were two areas of study that emerged to parallel civics in the late nineteenth century worth noting. At the close of the century, political science and political economy had emerged as courses closely aligned with civics. Both are worth examining because they harbor some early evidence of the kinds of thinking that would lay the groundwork for incorporating statistics into civics and because both courses ultimately were incorporated into social studies education and, to an extent, into civics.

Political science emerged in the second half of the nineteenth century, though a review of the articles of the day on the subject reveals that political science was usually a college or university course. In “The Study of Political Science In Colleges,” author I.W. Andrews (1881) writes, “The question in the class-room is not what will be for the advantage of this party or that, but what is the truth. The inquiry is what does the constitution say? What laws have been enacted under it? And what has been the judicial interpretation of those laws?” (pp.184-5). Andrews’ truth seems to be quite different from the moral “truth” to be debated by Harley’s young students. It is within this distinction that political science differentiated itself from most of the offerings of civics courses. Political science grew from the recognition of the undeniable scientific and industrial progress of the late nineteenth century. Science, at least a loose interpretation of the word, was embraced by nearly every social, economic, religious, and political entity of the day and what defined science for the average layman was the search for the truth, Political science responded by becoming a study of the truth as it existed and could be found in text, speech, and actions.

The second course of study to parallel the emergence of civics in the second half of the nineteenth century was political economy. Just a cursory reading of the literature related to political economy as it was understood in the late nineteenth century reveals that many authors and educators had a wide and varied interpretation of what political economy meant. It is clear, however, that no matter what subjects of study instructors in political economy ascribed to the course, political economy was a response to a sense that the effects of the industrial revolution were transforming America and that keen observation of these effects could uncover, and perhaps lead to the ability to predict, human actions and behaviors. The scientific nature of political economy was alluded to by many educators of the day, among them Burchill, who explained this nature via his 1891 paper entitled "Political Economy In The Schools":

> As civilization advances, and as population increases, as the machinery of government becomes more and more intricate, and the adjustments and relationships of its parts more complex, the study of the laws and principles by which society is held together becomes more and more important. (p. 91)

Burchill also explained that political economy, like political science, placed a premium on reasoning and discovering fact through experience, observation, and deductive reasoning. Burchill's conceptualization of political economy as embracing scientific elements of laws and principles, the complex machinery of government, and of "…results arrived at by deductive reasoning [that] can easily be verified with the facts of actual experience" (1891, p. 93) begins to provide some historical context for the emergence of scientific thought within courses that were ultimately considered as part of the social studies, the emergence of the social sciences, as well as for the eventual inclusion of mathematics and statistics within the social sciences and the social studies.

In addition to the emergence of political science and political economy, a third focus of study that developed out of the rise in the importance of science and scientific inquiry, the belief that facts or truth could be discovered, and the sense that human behaviors could be predicted and controlled, was social problem solving. While political science became a course of study more closely associated with the curricula of colleges and universities and political economy would eventually splinter into the disciplines of sociology and economics, social problem solving was an issue in civics that emerged in the educational literature of the 1880s and would continue to be a topic of interest for at least another century. C.J. Bullock, writing of the benefits of instructing students in political economy, determined that a relationship existed between learning about governmental and civil history and institutions and having students become capable of recognizing and solving pressing social questions and problems (1891). As the Progressive Era unfolded, social studies educators like Harold Rugg would champion this relationship between civics and solving societal problems.

It is ironic that civics was stumbling for direction, identity, and purpose in the twilight of the nineteenth century, given that it would take some fifteen years before the term *social studies* was first used by a major national educational organization. Yet the roots of *factual* and *scientific* study and rigor in the subject areas that would feed into the social studies were beginning to take hold, albeit with a tentative grasp. At the dawn of the twentieth century, these small, tentative roots would begin to take hold in the social studies curriculum.

American Civics in the Twentieth Century Recognizes A Role For Mathematics

One of the issues gathering momentum in civic instruction at the dawn of the twentieth century was a call by some educators to make courses in civics more practical and therefore less abstract for students. "Throughout the country today," chastised R. Welling in "The Teaching of Civics and Good Citizenship In the Public Schools," "…in the great majority of instances, you are merely teaching the rules that govern the organization or form of government, and this, as you must realize, is scarcely more than the very beginning of civics" (1903, p. 98). Welling and other like-minded teachers of civics believed in using the classroom and schools to model various forms of government and organizing schools and classrooms to function like small societies.

Overshadowing, at least for a time, this notion of turning schools into functioning societies with governmental roles for the children to play was social problem solving. Like the idea to develop classrooms and schools into small societies, exercises in social problem solving grew out of the perceived need for civics to move beyond the procedural hows and whys of American government and towards a practical, applied approach to the teaching and learning of civics. Indeed, applying knowledge and skills learned in civics class to real and pressing social problems of the day, according to Butler (1909), was a backlash against the "…sorry travesty upon the serious business of training for citizenship, that it should be thought we can make citizens by teaching the external facts relating to the machinery of government alone" (p. 79).

Butler's assertion that the teaching of "external facts" related to civics was not compatible with serious training for citizenship is representative of the types of arguments penned in some of the leading educational journals of the era. What came to replace instruction in external facts of citizenship in the first two decades of the twentieth century was driven by two similar themes. The first was the notion that civics needed to prepare students to be more conscientious, intelligent, and ethical in performing their civic obligations (Hunsaker, 1912). The second theme to emerge in civics instruction was that civics should prepare the youth of the nation to become the social problem solvers of tomorrow (Todd, 1912).

These two emerging and related themes of civic instruction grew from a societal background that was growing more economically, socially, politically, and religiously complex as the industrial revolution continued to unfold. Poverty, failure, intemperance, and what was perceived to be a growing moral and ethical decay on the part of the American populace helped fuel enthusiasm for teaching the youth of the day to become more active in regard to their duties and responsibilities as American citizens. A shift in attention and focus in civics was beginning to occur on a national level, a shift that resulted in less "drill and recitation" in *duties* of citizenship to more progressive forms of teaching about the *responsibilities* of citizenship.

A great deal of national attention regarding the focus and intent of civics education was generated through the publication of the 1916 Report of the Committee for the Social Studies by the National Education Association. Though the theme of cultivation of good citizenship emerged from the 1916 Report, the formal course of citizenship had yet to be born (Hertzberg, 1981 p. 26). The cultivation of good citizenship was understood to be a *de facto* result of studying the social studies. These two largely competing conceptualizations regarding how good citizenship should be cultivated – via a stand alone course of civics education within the social studies or that good citizenship would naturally develop from study of an associated group of social studies coursework – have been at odds since the inception of the social studies (Shaver, 1996).

The onset of the First World War curbed some of the enthusiasm for teaching students the responsibilities of citizenship in favor of teaching the duties of citizenship and in some ways also served to slow the pace of more progressive instructional reforms (Best, 1960). Civics seems to be the discipline most sensitive to national and global crisis, and the First World War was no different than the periods of massive immigration in to the United States in that the onset of the First World War largely caused a return to familiar patterns of less controversial means of instruction and the use of what was seen as less controversial materials and subject matter. It should be noted, however, that there was a curious result of America's entry into the First World War that actually served to advance interest in more controversial forms of instruction in critical thinking, questioning, and social problem solving. When the First World War ended in 1918, a flock of educators and psychologists spent time living in Germany to study German schools and society. Much reflection and press was devoted to the notion that American schools, like their pre-World War German counterparts, were seen as stifling individualism and aspirations of youth (Frey, 1920). Educational leaders began to speak and write of a need for American students to begin to analyze, criticize, and think for themselves. As Levin wrote in 1923, "…without the ability to think clearly, weigh evidence, to discriminate between good and evil, to apply one's mind to the understanding of the weighty problems of our time, no formal education discipline is worth the cost" (p. 4). Clearly, the lessons of the First World War weighed heavy on the minds of some American educators.

The Influence Of World War I On Civics Instruction: 1920-1936

It was the period just after the First World War that marks a convergence of a number of new and related concepts in civic instruction. The student of civics in post-World War America needed to learn to discriminate between good and evil and to understand contemporary social problems. "The main trouble [with civics education] is that the future citizen is not taught to analyze without prejudice the problems which are his and the community's," wrote H.W. Guest in 1928 (pp. 346-7). Guest's position also marked a new and related concept in civics instruction – that students of civics should develop a scientific attitude with which to scrutinize their opinions and prejudices, an attitude that he believed would be of help to future citizens faced with complex social problems:

> …it is of the utmost importance that the scientific attitude, the objective point of view, be cultivated. This must involve the use of a generous amount of problems, projects, or cases. These problems should have a realistic character and should not be "solved" in a hasty or dogmatic fashion, but should be studied from various angles and in considerable detail. The student should not merely be taught to believe that he is thinking for himself, but in so far as possible he should be taught actually to think for himself. (p. 347)

The foundational work relating to encouraging students of civics to think for themselves, to ask important questions, to understand and to solve social problems, and to weigh and analyze evidence clearly had commenced by the second decade of the twentieth century.

Yet it is also clear that the roots of incorporating mathematics and statistics in civics education had not taken hold, though there are some early indications that some were beginning to recognize a relationship between civics education and teaching students to weigh arguments, to analyze conclusions, and to engage in critical thinking.

The importance of the rise of the social sciences, statistics, and the belief that the civics classroom could serve as a practical arena in which to obtain and work with social data also cannot be ignored. Statistics, though a branch of study over four hundred years old, did not really develop into a recognized and formalized course of study in this country until the early twentieth century. Familiar only to a small handful of scientists and mathematicians of early America, statistics grew into a more generally understood and accepted tool largely through the work of R.A. Fisher. Fisher was instrumental in broadening the understanding of what statistics was and could do largely because of two beliefs he held about the discipline. The first was that experiments that employed the use of statistics were best constructed from realistic situations. The second was that statistics needed to be explained via clear, practical, and real world examples. Fisher's beliefs and ability to translate complex and often confusing statistical operations led him to publish *Statistical Methods For Research Workers* (1925) and *The Design of Experiments* (1935), seminal works that introduced numerous professional and lay people to the world of statistics.

Largely as a result of Fisher's works, public interest in statistics and statistical operations grew throughout the 1920s and 1930s. The recognition of the potential value of applying statistical methods in ways previously not thought of was seized upon by a number of prominent educators of the era, though for different reasons and purposes.

Helen Walker, writing in the April 1931 issue of *The Teachers College Record* explained that, "Statistical method is a tool for organizing facts so as to render them available for the study of the philosopher, the historian, the psychologist, the curriculum builder, the sociologist, the economist, and the administrator" (p. 603). Dr. Walker understood that applying statistics and statistical methods to any discipline or area of study was a potentially valuable tool. The sciences, according to Walker, were already benefiting from the inclusion of statistics into their realm of study – the same would prove true in educational research:

> The object of a *statistical* study is not a single event or individual but a group of events or individuals, and the outcome of statistical investigation can never be stated as a single immutable law which is invariably true for all members of the group, but its conclusions must be stated as a tendency which is true in the main for the group but not necessarily true for any individual in the group…schools are not administered for a single child but to give maximum advantages to all children. Studying one child does not develop educational philosophy intensively, but by envisioning the common needs and problems of the many. Curricula are built for thousands of children…Thus it seems inevitable that so long as our educational programs are built for masses of students, so long must statistical method remain the primary language of educational research. (pp. 602-3)

While Walker made the case for the increased inclusion of, and reliance upon, statistics and statistical methodology in educational research, she also briefly alluded to the issue of the impact of those who lack a statistical understanding or those who might become the victims of statistical abuse. In language that is ironically similar to language used nearly seventy years later by Lynn Steen and John Paulos, Walker concluded that:

> In still other ways the purposes of statistical method are sometimes so misunderstood or its nature so abused that it is distorted into the guise of a despot instead of an agent of democracy. Men see the increasing prevalence of statistical method in scientific studies and, failing to grasp the underlying reasons for this development, assume that the use of tables, formulas, and numerical summaries is a mere badge of respectability. (p. 604)

Walker wrote "Democracy and Statistical Method" in 2002 to support the growing recognition of the importance of applying statistics and statistical methods to educational research, yet Walker's article also raised some important implications for teachers of civics, implications that were likely difficult to ignore. Statistics, according to Walker, could be a powerful ally to the citizen of a democracy yet, as the author warned, could also be a powerful ally to the despot if a citizenry fails to understand the uses and abuses of reasoning from statistics.

A second and related development that served to give rise to the inclusion of statistics in civics education was the increasing recognition and support of teachers of mathematics to view the social studies as a practical arena in which to gather pertinent social data to use in mathematical and statistical operations:

> Educators are trying to find the right way to teach mathematics. They are making a diagnosis of the condition of society. They are asking what is the situation that actually obtains in the world in regard to the use of mathematics. They are asking

> of the common man in the street not what mathematics to teach but what mathematics does he actually use. (Goodrich, 1933, p. 241)

J.T. Rorer's "The Social Qualities of Mathematics," which appeared in the 1934 issue of *The Mathematics Teacher*, is illustrative of the trend by some in the field of mathematics education to embrace the data to be found in the real or social world. For Rorer, this real world context was revealing itself in his mathematics classroom:

> The reading of current literature requires more mathematics than was necessary twenty or more years ago. A recent front-page news item in *The Philadelphia Public Ledger*, describing some discovery in atomic structure, spoke of a metric distance of 10 to the minus 24th power. What does it mean? Even the juvenile magazines, the Sunday puzzle pages, and the aircraft columns of the evening paper contain considerable mathematics. The young readers bring clippings to the classroom sometimes with the request, "Please explain this"; sometimes proudly with the statement, "I was able to solve this," or "I understand this because of our work in mathematics." (p. 83)

A third development that served to give rise to the inclusion of statistics in civics education was the development of the social sciences. The *historical* development of the social sciences is not nearly as germane to the purposes of this paper as the argument by some that any subject referred to as a science must include objective means of measurement. It would be tempting to conclude that mathematics and statistics were always considered integral components of the social sciences. Ella Prendergast's "Mathematics and Social Science" (1933) illustrates that this conclusion would be inaccurate. Predergast's article is typical of others of the period that deride any references to courses of study as social *science* without such courses having embraced statistical or mathematical measurement as a component part of the curricula:

> Just as it has now been acknowledged that geography, history, occupations, and the like, constitute an inseparable unit, so it must inevitably be seen that they are unworthy of the name social *sciences* unless they incorporate in their work the quality of measurement which only mathematicians can contribute. (p. 34)

Measurement, and the respectability that measurement brought to any field or study willing to embrace it, quickly became the norm in a number of articles and studies published throughout the 1930s. As the attention and respect paid to the inclusion of what was seen as *objective* (mathematical and statistical) measurement increased, so too did the number of articles that began to attempt to align mathematics and the social studies. In so doing, some subjects of the social studies were elevated to the status of social *science*, regardless of age and academic level of the pupils.

This increasing alignment of statistics and the social studies during the 1930s still did not specifically correlate civics with a need to understand how statistics could be used or abused to either the benefit or detriment of a democratic citizenry. In those articles that attempted to correlate mathematics with social studies, most authors focused upon mathematical *operations* that could be applied to social information. Halter and Bill's "Social Science and Mathematics Get Together" (1933) offered suggestions for activities such as teaching students how to keep a checkbook, compute rates of interest, read gas and electric meters, and construct family budgets. While all of these suggestions might lead to the development of valuable skills on the part of the social studies student, no explicit or implicit connections were drawn between the use of statistical information by private and public entities and the need to understand how tests are conducted, samples randomized, how data is presented, and how conclusions are drawn from such information in order to evaluate the quality of the work and ask meaningful critical questions concerning the data, procedures, and conclusions.

Another example of this type of alignment between mathematics and social studies was George A. Moe's "How To Correlate Mathematics and History" (1934). Like Halter and Bill's article, Moe's correlation of mathematics and history centers on computational skills applied to social and historical data. Moe identifies the mathematical topics of graphing, ratio, proportion, percentage, taxes, mensuration, and transmitting money. Though Moe's article provided additional support to the idea that some teachers of mathematics and the social studies were advocating for the conjoining of the disciplines on some level as early as the 1930s, the exercises Moe described as having assigned to his eighth grade classes were decidedly of the operational and computational variety. For example, Moe suggested that students calculate the percentage of rural as opposed to urban dwellers in 1790 and in 1932, yet these two problems are presented as separate exercises with no attempt to correlate results between the two figures or to provide an opportunity to ask important and critical questions regarding the reasons for population shifts that occurred between those two time periods.

The types of activities and assignments outlined in articles that attempted to correlate mathematical and statistical study with disciplines within the social studies underwent substantive changes in the latter half of the 1930s. More general calls for the inclusion of mathematics in the social studies began to appear in professional journals. In 1937, Eugene Hellmich of Columbia Teachers College surveyed a sample of textbooks from the social studies and mathematics to determine if, and to what extent, mathematics played a role in contemporary social studies education. Hellmich's conclusion was that a number of mathematical concepts were to be found in social studies texts, and recommended that teachers of the social studies renew their interest and efforts to teach mathematical principals to students of the social studies as a necessary component of a comprehensive social studies education.

Educators interested in incorporating statistical study within the social studies also began to write of student projects designed to provide students of the social studies with more *hands on* experiences with statistical information and operations and of a need to teach students to analyze data and draw conclusions that could be supported by the data as an occupational skill. One such example is J. Fred Murphy's "A Student Survey of Local Occupations" (1936) in which he describes the work of three civics classes of the senior high school of Logansport, Indiana. The three classes were assigned to make a statistical study of the occupations of the citizens of Logansport and create a written component that would note the purposes and aims of the survey, the method and procedures, the limitations of the study, the facts obtained, and the conclusions students drew from the survey.

Murphy's project was a departure from the exercises and activities described earlier by advocates for correlating mathematics and social studies for three significant reasons. First, Murphy assigned his students the task of collecting the data thereby allowing his students to experience first-hand the trials and tribulations of data collection, organization, and analysis. Second, Murphy's students were required to draw conclusions from the data they collected and ultimately analyzed, conclusions that inevitably required the students to ask important civic questions regarding their home town. Murphy's students did not simply enumerate the number of Logansport citizens employed in manufacturing or professional occupations, they concluded that Logansport was gradually experiencing a transitional period of employment which shifted the center of employment from the railroad to a mixed urban and rural community that had no single dominant employer. Murphy's students were required to reflect upon the reasons why they thought that this transition was occurring and what implications it held for the future of their town. These activities strongly suggest a third reason why Murphy's project was a departure from the exercises and activities described earlier by advocates for correlating mathematics and social studies: it correlated mathematical and statistical study with *civics*.

In looking across the spectrum of articles that related mathematics education with social studies and civics, it becomes clear that a steady momentum was building towards meaningful integration of mathematics and statistics into the civics curriculum. Out of the growth of statistics and social science, the first hesitant steps were taken, yet it would require an additional evolutionary step before educators would begin to write of a deeper relationship that existed between mathematics and democracy. This evolutionary step came in the form of a new term, *quantitative thinking*.

A.C. Rosander and Quantitative Thinking

It is unclear if Rosander, a research fellow for the General Education Board of New York, was the first to use the term *quantitative thinking*. What is clear, however, is that Rosander was among the first, if not the first, to recognize, formally label, and articulate in detail the relationship between mathematics and an informed citizenry. Rosander, a professor of mathematics, believed that

> Our social science teachers avoid the quantitative aspects of social problems while our mathematics teachers avoid the social implications of quantitative principles. There is a real need to bridge this gap, a process which we think will add stability to mathematics and accuracy to the social sciences. (February 1936, p. 63)

In a strikingly similar choice of words to Steen's descriptions of a "quantitatively illiterate citizenry" of 1997, Rosander suggests that "In a quantitative age such as ours, quantitative thinking is just as important as ordinary linguistic thinking; in fact one may argue that it is more important" (February 1936, p. 63). What makes Rosander's article revolutionary was that is was such a stark departure from a belief – a belief still held by some today – that has followed mathematics since the inception of the discipline. Rosander did not equate a benefit of mathematical study and usage with developing within students better *habits of mind* or *mental discipline* through mathematical study and reasoning. The benefits of employing mathematics in the social sciences stemmed from using mathematics as a tool with which to better understand social data and social problems.

Rosander's views on incorporating mathematics and statistics into the social sciences was not only revolutionary because of the way in which he viewed mathematics as a tool of an informed citizenry, but also in the way he conceptualized how this correlation between the disciplines should take place:

> [There needs to be] more discussion and less computation, more insights into principles and problems and less drill, more content from the social sciences and less from the physical sciences, more stress on real individual and social problems and elimination of irrelevant and fictitious problems, more stress on social utility and elimination of content for its own sake, more stress on practicing quantitative thinking and less on just going through the motions in order to pass a test. (February 1936, p.63)

Rosander's ideas concerning how to bring about quantitative thinking in the classroom involved using mathematical and statistical problems to help bring about a deeper understanding of both mathematics and social science content, exercises designed to expose students to the importance of statistical accuracy in reported social data, how terms like *average* and *normal* are related and often misunderstood, how percentages, rates, ratios, sampling, trends, and predictions are reported in the newspaper, and how data is interpreted and reported. In arguments similar to those made by reform minded mathematics educators of the 1990s, Rosander expressed concern that mathematics instruction had become simply too abstract and impractical to be of use to the average high school graduate. Rosander preferred instructing students to become comfortable in using a "…type of quantitative thinking and quantitative analysis which will help every young American better understand those social and economic problems which now face this nation" (October 1936, p. 294).

By 1937, Rosander was given an opportunity to create a pilot course that would reflect the very philosophy, ideas, and exercises about which he was writing. In establishing this practical course that combined mathematics and the social sciences for students of the senior high school of Bronxville, New York, Rosander coined yet another term that remains in use to this day – *social mathematics*. Rosander's experimental course was clearly an attempt to correlate mathematics and the social sciences, chiefly through an examination of social problems. The purpose of the course, according to Rosander, was to develop within students:

> …a scientific attitude toward social, economic, and political problems by means of quantitative and logical techniques of thinking. More specifically, the purpose is to develop proficiency in social and economic and political thinking with regard to (1) sources of information (2) analysis of data, and (3) interpretation of data. (1937, p. 338)

Rosander's experimental course divided students into two groups: the worker and the consumer. Each group was to read and study realistic situations, interesting stories, newspaper accounts, and personal experiences that illustrated the utility of mathematics and statistics in understanding the problem or issue described. Students discussed such questions as how occupations changed over the years and what affected one's chances of finding employment (Rosander, 1937).

Rosander was not the only educational researcher reflecting upon and writing about the potential role for mathematics and statistics within the social studies. Between the late 1930s and early 1940s, a rise occurred in the number of articles devoted to correlating mathematics and statistics with social studies (and increasingly civics) education. Much of this rise can be attributed to the fact that teachers of both disciplines were looking for ways to revitalize teaching and learning via correlating their discipline with other subject areas. While it is true that correlating civics education and mathematics was perhaps the least represented in all of the articles devoted to correlating one subject area with another, it is clear that the teachers of both disciplines were beginning to understand and recognize that mathematics and civics had more in common than some had assumed. Similar to Rosander's groundbreaking conceptualization of quantitative thinking, these new articles focused on habits of mind and manners of thinking, not upon exercises that incorporated arithmetical operations into instruction that used social data.

While it is perhaps accurate to suggest that there existed greater interest in correlating mathematics and civics education, it would not be accurate to suggest that teachers of the social studies were as ready as their colleagues in mathematics to substantially embrace mathematics as a component of a social studies education. There are two notable exceptions – Proctor Maynard and R.E. Heiges. Maynard, a social studies teacher in a Michigan high school, wrote a thought-provoking article in the January, 1940 issue of *The Social Studies*. Maynard seized upon the ability of statistics to provide deeper meaning to social data: in this case, statistics provided by the United States Census. Maynard wrote of having his students develop their own analysis and interpretations of statistical information provided by the Census, not just having students recall the numeric information. Maynard would also have his students examine successive Census data from the same location to determine trends in population, immigration, social and economic mobility, and birth and death rates in order to answer questions about changes in local populations. R.E. Heiges's "What May Social Studies Expect From Mathematics?" (1939) emphasized the importance of working with mathematical concepts like majority, minority, average, proportion, ratio, percentage, and calculation of interest. The main focus of the article, however, was devoted to challenging students of the social studies to ask useful statistical questions of social data in order to achieve a much more comprehensive understanding of social studies material.

While Maynard and Heiges underscored the important role that mathematics and statistics could play in social studies education, most teachers and researchers of the social studies who recognized that mathematics could play a role in social studies education were not as overt as Maynard and Heiges when it came to calling for substantial alignment between the two disciplines. Much of the educational literature published by social studies professionals of the era seemed to walk a fine line between advocating for instruction in critical thinking, social problem solving, interpreting information, judging and analyzing evidence, and drawing informed conclusions from data (Ellis, 1942; Marcham, 1942; Wesley, 1941; Wrightstone, 1941), and outright calling for the inclusion of more mathematics and statistics in social studies and civics education. To a large extent, these related skills of civics education – critical thinking, social problem solving, interpreting information, judging and analyzing evidence, and drawing informed decisions from data – represented a marked departure from past instruction in the discipline. Teachers of civics were increasingly advocating for teaching students to think for themselves, to question what was presented to them via the media, and to ask questions about *facts* and *the truth*.

Some of this change in instructional focus can likely be attributed to lessons learned as a result of American participation in the First and Second World Wars. Americans witnessed the rise of totalitarian and dictatorial forms of government and had likely come to some conclusions regarding the responsibility of citizens to question government actions or inactions. Americans had also survived the horrific suffering endured during the Great Depression, an experience (along with the emergence of sociology as a discipline of study) that gave rise to the hope that societal problems could be solved by citizens who were capable of recognizing and solving problems that were facing Americans (Best, 1960). The interrelated nature of these skills of civics – critical thinking, social problem solving, interpreting information, judging and analyzing evidence, and drawing informed decisions from data – were described as one of the eight functions of citizenship education by Edgar Wesley in "Nature and Functions of the Social Studies":

> The eighth function of the social studies is to furnish exercises in problem solving. Perhaps the phrase, critical thinking, would be appropriate here. The citizen is constantly meeting contradictions, uncertainties, and inconsistencies. The untrained person hopes for, and seeks to find a mechanical guide to help him in such situations. He thus tends to vote the ticket his father voted, to sign the petition which his neighbor signed, and to favor or oppose wars because his pastor does. The social studies, since they are filled with the phenomena that include these problems, must furnish practice in solving them. The nature of evidence, the techniques of propaganda, the credibility of so-called authorities, the motivations behind assertions – these and dozens of similar problems appear in great abundance in the social studies. How to find one's way in the maze is one of the possible outcomes of studying this field. (1941, p. 55)

In the same National Council of the Social Studies Yearbook, J. Wayne Wrightstone drew a clearer parallel between Wesley's aims and purposes of critical thinking and recognition of bias and propaganda to a democratic society:

> The democratic way of life is one which requires the ability to obtain facts, to sift and weigh the facts in drawing conclusions, and applying social science generalizations. Such power of critical appraisal of facts are needed in a society based upon reason and judgment in determining policies. (1941, p. 238)

Neither Wesley nor Wrightstone made overt calls for the inclusion of mathematics or statistics in instructing students to weigh evidence, analyze data, think critically, or draw conclusions based on data. A third author and educational practitioner of the era, Frederick Marcham, came as close as any contemporary social studies educator to specifically include statistics, and the information derived from statistics, as challenges to traditional instruction in civics: "Words, phrases, statistics, graphs – indeed all ways by which information and ideas can be communicated from person to person – may be misunderstood unless careful effort is given to clarify their meaning" (1942, p. 17).

While Marcham seemed concerned for a citizenry that might misunderstand information presented to them via the media and other outlets, Elmer Ellis was concerned more about an American populace succumbing to wartime propaganda. Ellis' "Methods And Materials For Developing Skills In Critical Thinking" was a substantive treatise on the uses of faulty statistics employed in techniques of propaganda. Ellis, who edited the 1937 National Council For The Social Studies Yearbook entitled *Education Against Propaganda,* wrote of including statistics and reasoning from statistics in social studies instruction as a safeguard against Axis propaganda. If students could be taught first to discern fact from opinion by using statistical reasoning, then they could be instructed to discern propaganda from the *truth*.

As is to be expected, mathematicians writing on the subject of correlating mathematics with civics education historically have placed a larger premium on the role that mathematics could play in developing future citizens capable of the kind of quantitative thinking championed by Rosander. Social studies teachers like Heiges, Maynard, and Ellis were the exception, not the rule, when it came to advocating for a greater role for mathematics in the social studies and civics curriculum. Teachers of mathematics (Bell, 1939; Brown, 1941; Fawcett, 1947; Hannelly, 1941; Scates, 1943) were still at the forefront of articulating a *direct* link between the health of a democracy and the statistical knowledge of her citizens, as evidenced by a rapid succession of articles devoted to the link between mathematics and democracy as understood by some of the leading mathematics educators of the era.

One of the reasons why it is not surprising that mathematicians seemed at the educational forefront of arguing for the importance of a mathematical and statistical understanding on the part of the nation's citizens has to do with the Second World War. It is likely that some mathematics educators, like educators in other disciplines, were concerned with publicly correlating their discipline with the war effort. It is logical to assume (and indeed the literature of the era reflects this) that civics educators of the era were more concerned with democracy education and instilling a sense of patriotism, service, and national pride in the youth of America in the face of the growing threat of war (Best, 1960). Additionally, the nature and scope of the arguments in favor of including mathematics and statistics in civics were often one of questioning popular or official information and conclusions – not a popular curricular stance in civics education in times of national and international crises.

The educational literature devoted to the subject of correlating mathematics with civics published in the years following the end of the Second World War began to reflect two general themes. These two themes continued to be represented in the literature, albeit with slight modification, throughout the remaining decades of the twentieth century and into the literature of today regarding the link between mathematics and civics. The first theme to emerge is one of a growing link that reflected a relationship specifically between mathematics or statistics and civics education. Prior to the second half of the twentieth century, nearly every author writing about correlating the subjects used the broader classifications of *mathematics or statistics* and *social studies*. The second theme to emerge in the post war literature that continues to this day was a more coherent identification of what specific types of citizenship skills could benefit from the inclusion of statistics. Teachers of mathematics (Fawcett, 1947; Flynn, 1953; Meehan, 1954; Scates, 1943; Smith, 1967) and of the social studies (Bough, 1956; Engle, 1960; Evans and Crary, 1951; Haefner and Cummings, 1956; Hyman and Sheatsley, 1950; Mossman, 1947; Stutz, Fulkerson, Helmer, and Stoutenburg, 1953), wrote of how mathematics and statistics could inform the citizenship skills of critical thinking, problem solving, judging and analyzing evidence, decision-making, and interpreting information.

One of the benefits of examining the history of academic theory and practice regarding the correlation of statistics with the social studies and ultimately with civics is that such an examination can lead to the identification of those areas within mathematics and civics in which the educators of both disciplines agree that a particularly strong relationship does or should exist. The three areas of civics education that seem to resonate most strongly among teachers of mathematics *and* teachers of the social studies among the five previously cited examples are interpreting information, judging and analyzing evidence, and decision-making. Throughout the second half of the twentieth century, these three skill areas of civics became increasingly difficult to separate and are alternatively identified in the literature of the era as decision-making skills or skills of judging and analyzing evidence.

To be sure, the two other areas of civics education identified earlier – critical thinking and social problem solving – have a documented relationship with both social studies and mathematics. Teaching students to be critical thinkers, for example, can be traced back to as early as 1893 (Page, 1992). Much like the skills of problem solving, judging and analyzing evidence, decision-making, and interpreting information, however, the skill of critical thinking did not include a recognized mathematical component (at least by social studies educators) until nearly a half-century later. The Second World War prompted some social studies educators (Ellis, 1942; Marcham, 1942) to consider the role that critical thinking could play in shielding American students and citizens from Axis propaganda. If students were to judge and evaluate propaganda effectively, then they would need to recognize and understand all of the different manners by which propaganda was communicated – manners that included numerical data depicted in charts or graphs and statistical representations of data (Marcham, 1942).

In comparison to teaching students of the social studies to be critical thinkers, teaching students to be social problem solvers has a more recent history (Best, 1960). While it would be easy to assume that a term as overtly mathematical in sound as problem solving would incorporate mathematics or mathematical thinking, this assumption would prove false. Solving social problems like poverty and hunger was born from a pedagogical movement that emerged in post-World War One progressivism (Best, 1960). The aims and goals of some social studies educators of this period were typified by Harold Rugg (1923), who was instrumental in the development of a social studies text that centered instruction and learning upon social problems of the era. However, an understanding and articulation of the important role that mathematics and statistics could play in social problem solving would not emerge until the middle of the twentieth century, when some social studies educators (Blough, 1956; Jennings, 1956) suggested that social problem solving did indeed have a mathematical and statistical component. In Blough's "Science and Social Studies In Today's Elementary School" (1956), the author writes of "problem solving behaviors" (p. 205) – behaviors that include substantial uses of mathematics and mathematical reasoning – that every pupil must go through in a problem solving process. Blough was quick to point out the necessity of analyzing mathematical and statistical information and arguments in fundamentally text-based social questions such as, "Is the fluoridation in the water supply dangerous?" or "Will atomic and solar energy make us independent of fossil fuels?" (p. 210).

Even within both of these examples, typical of other articles written on the subject of correlating mathematics and statistics with skills of critical thinking or social problem solving, can be found the fundamental operations of interpreting information, analyzing evidence, and making informed decisions. These three skills of citizenship continued to emerge and be refined as the twentieth century came to a close. To a large extent, these three skills of civics became increasingly intertwined – much like the skills of statistics and civics that were to be applied to information to be understood and analyzed, and to decisions to be made. The result of this amalgamation of skills informed by both civics and statistics emerged at the twilight of the twentieth century as *social mathematics* or *quantitative literacy*.

Defining Social Mathematics

As a significant portion of the focus and intent of this study is to identify and analyze incidents of social mathematics in the curricula of civics, it is critical to define exactly what is meant by the term. For the purposes of this study, social mathematics is defined as:

…a construct of the social studies that combines instruction in the use of certain mathematical and statistical terms, concepts, and skills (e.g., probability, sampling, dispersion, mean, median, mode) with realistic and practical applications of these terms, concepts, and skills to common daily civic activities (e.g., making sense of a newspaper story, analyzing evidence in support of policy, or deciding if one supports social security reform). Social mathematics includes instruction and realistic practice in recognizing, collecting, measuring, judging and analyzing information presented numerically, recognizing conclusions drawn from data that are faulty, and communicating mathematical and statistical evidence and conclusions to others.

Why offer this definition of social mathematics? The preceding section served to identify historical roots of the inclusion of mathematics and statistics in civic instruction, yet it did not help to identify and define a term that can be applied to describe this conjoining of mathematics, statistics, and civics. What the preceding section also served to illustrate is that the term social mathematics is deeply rooted in the social sciences and in mathematics. Historically, there were mathematicians and mathematics educators who argued that more mathematics and statistics should be include in civic instruction and crafted their argument from a mathematician's perspective. There were also social scientists and social studies educators who made similar arguments, yet from a civic perspective. As is to be expected, there are contemporary social studies educators, mathematicians, and mathematics educators who advocate for the inclusion of mathematics and statistics in civic instruction in similar fashion. The definition of social mathematics offered at the beginning of this section identifies the core concepts, skills, and ideas as offered by contemporary social studies and mathematics educators, while also recognizing the historical perspective of the same.

Related to this need for a precise definition of social mathematics is an explanation of how the definition offered above came to be developed. In any attempt to analyze the ways in which people have historically defined and used the term, it is necessary to accept some definitions and usages and reject others. The genesis of this study is rooted in an initial examination of the ways in which contemporary educators are integrating mathematics and civics. Conducting multiple Internet and library searches designed to identify individuals who have published material over the past twenty-five years began this initial examination that addresses issues related to the combination of mathematics and civic instruction.

The search revealed a number of interesting and diverse results. There was a relatively small number of individuals, groups, and schools working to integrate, on some level, mathematics and the social studies. Bernard Hollister, a high school history teacher from Illinois and later a member of the Illinois Mathematics and Science Academy, wrote extensively on the uses of social mathematics in the history classroom. Patricia Kline Cohen, a professor of history, wrote a revealing examination of the history of economic, political, medical, historical, and social uses of numbers in early American society entitled *A Calculating People: The Spread of Numeracy In Early America.* Claudia Zaslavsky, retired from teaching mathematics, wrote of the uses of mathematics in social and cultural objects like quilts and pottery. A host of reform-minded mathematics teachers wrote of ways to incorporate social data into mathematics classes to make them more realistic for students.

The search also resulted in the identification of three individuals most associated with a particularly interesting relationship between mathematics and civics education: H. Michael Hartoonian, Professor of Social Studies Education, and Lynn Arthur Steen and John Allen Paulos, both Professors of Mathematics. All three wrote of a connection between the mathematical and statistical ability of the general public and the health and welfare of a democratic society. Mathematical ability in the twenty-first century, they argued, was akin to the ability to read and write in the eighteenth century. Here were three individuals that represented the fields of mathematics education and social studies education advocating for a greater role for mathematics in civics education.

A third result of the search was that it revealed different terminology and nomenclature used by those interested in the mathematical ability of the general public. *Quantitative literacy*, *numeracy* and *innumeracy* emerged in the last quarter of the twentieth century and were used almost exclusively by mathematicians and mathematics educators. All three terms were used to convey a sense of mathematical literacy on the part of the general public, an ability to make sense of, and work with, numbers. All three terms were also concretely linked to civics education and to the assertion that individual citizens were placing themselves at social, economic, and political risk as a result of their inability to work with numbers. *Social mathematics*, although a term coined by a mathematician, emerged as the term used by social studies educators when speaking or writing of the need to incorporate more mathematics and statistics into the social studies classroom. Those who spoke and wrote of the goals of introducing social mathematics to their social studies students were seeking to achieve the same results desired by those mathematicians and mathematics educators who spoke and wrote of the importance of helping students to become more mathematically or quantitatively literate.

Why use the term social mathematics and not quantitative literacy or numeracy? First, social mathematics was a term introduced long before the advent of the terms quantitative literacy or numeracy. Second, although it is true that a mathematician first used the term social mathematics, social studies educators (Hartoonian, Laughlin, & Sanders, 1991) adopted social mathematics as *the* term to describe a particular relationship between mathematics and civics. Finally, the term social mathematics and its definition recognizes the important civic component of social math – that every citizen who lacks a fundamental understanding of the ways in which numbers and statistics are used and abused in American society is at a personal and professional disadvantage when it comes to fulfilling the rights, duties, responsibilities, and privileges of American citizenship.

After analyzing the results of the initial search, a more targeted search ensued that examined the ways in which mathematicians, statisticians, mathematics educators, and social studies educators defined and used the terms *social mathematics*, *quantitative literacy*, and *numeracy*. Was everyone essentially speaking and writing of the same concepts, skills, and goals for students, or did there exist fundamental and important differences between *social mathematics*, *numeracy*, and *quantitative literacy*? A brief synopsis of that search appears on the following pages.

Developing A More Precise Definition

Historically speaking, the term *social mathematics* was first used by A.C. Rosander, a research fellow for the General Education Board of New York. Rosander, a professor of mathematics, was among the first to recognize, formally label, and articulate in detail the relationship between mathematics and the social studies. Rosander believed that

> Our social science teachers avoid the quantitative aspects of social problems while our mathematics teachers avoid the social implications of quantitative principles. There is a real need to bridge this gap, a process which we think will add stability to mathematics and accuracy to the social sciences. (February 1936, p. 63)

Rosander set out to bridge this gap by introducing into the mathematics classroom social data to be interpreted by students. This interpretation involved using mathematical and statistical problems to help bring about a deeper understanding of both mathematics and social science content. Specifically, problems were designed to expose students to the importance of statistical accuracy in reported social data, how terms like "average" and "normal" are related and often misunderstood, how percentages, rates, ratios, sampling, trends, and predictions are reported in the newspaper, and how data is interpreted and reported. In arguments similar to those made by reform-minded mathematics educators of the 1990s, Rosander expressed concern that mathematics instruction had become simply too abstract and impractical to be of use to the average high school gradate. Rosander preferred instructing students to become comfortable in using a "…type of quantitative thinking and quantitative analysis which will help every young American better understand those social and economic problems which now face this nation" (October 1936, p. 294).

By 1937, Rosander was given an opportunity to create a pilot course that would reflect the very philosophy and ideas about which he was writing. In establishing this practical course that combined mathematics and the social sciences for students of the senior high school of Bronxville, New York, Rosander coined a term that remains in use to this day – *social mathematics*. Rosander's experimental course was clearly an attempt to correlate mathematics and the social sciences, chiefly through an examination of social problems. Although Rosander did not define the term *social mathematics* in print, he did include within his writing a statement concerning the purpose of the course, which was to develop within students:

> …a scientific attitude toward social, economic, and political problems by means of quantitative and logical techniques of thinking. More specifically, the purpose is to develop proficiency in social and economic and political thinking with regard to (1) sources of information (2) analysis of data, and (3) interpretation of data. (1937, p. 338)

Rosander's experimental course divided students into two groups: the worker and the consumer. Each group was to read and study realistic situations, "interesting" stories, newspaper accounts, and personal experiences that illustrated the utility of mathematics and statistics in understanding the problem or issue described. Students discussed such questions as how occupations changed over the years and what affected one's chances of finding employment (Rosander, 1937).

Although a number of mathematicians, mathematics educators, and social studies educators continued to write and speak of the important role that an understanding of mathematics and statistics could and should play in civics, the term *social mathematics* does not seem to have been widely used as a descriptor for the intersection of mathematics, statistics, and civic instruction after Rosander first used the term. It would be fifty-two years before the term would again appear in education-related literature. Perhaps ironically, this time the term would be used not by another mathematician, but by a social studies educator.

By 1989, the term *social mathematics* appeared in social studies education-related journals including the National Council for the Social Studies' *From Information to Decision Making: New Challenges for Effective Citizenship.* As the title implies, the issue was devoted to an exploration of the skills necessary for civic decision making in the age of computers and data that was increasingly numeric in form. *From Information to Decision Making* was the first bulletin published by the National Council for the Social Studies that dealt entirely with the subject of including mathematics, statistics, and computer science in the social studies. The title was suggestive: the information age had dawned and the teachers of the social studies needed to keep pace with the overwhelming advances in information production, classification, quantification, storage, retrieval and usage. The editors (i.e. Alter, Hartoonia, Laughlin, & Sanders) of the bulletin wrote of the purpose for *From Information to Decision Making* in the preface:

> …we are judged by the information we have available to us and how we use that information in our personal and professional lives. The information we have shapes our values, actions, personalities, perspectives on the world, and the decisions we make. This bulletin undertakes to provide readers with some ideas about ways social studies teachers may become effective teachers in the Information Age with its ever-increasing gap between what we understand and what we need to understand. (1989, p. vii)

From Information to Decision Making resonated with the theme to include a statistical component to social studies education in general, and to civics education in particular. Data interpretation, analyzing and weighing evidence, statistical analysis, and making inferences – all aligned earlier with the discipline of mathematics – were now being reconceptualized as integral to civics education. Some authors in *From Information to Decision Making* wrote of classroom exercises that would introduce students to numeric forms of social information (e.g., the census), teach students to manipulate numerical data in spreadsheet applications, to create graphs, charts and tables, and to develop databases of information. Although these articles introduced students to exercises and activities that incorporated statistics into social studies content (as opposed to a deeper integration of skills and modes of thinking and questioning), these articles and exercises were significant to renewing interest in the role that numerical information and statistics could play in civics for several reasons. First, exercises like creating charts, graphs, and tables in order to represent data and trends in numeric format likely illustrated the utility of translating a complex mass of verbal or written data into a more efficient format.

Second, exposure to the myriad of ways in which social data could be quantified would have illustrated the ever-increasing role that numeric information played in the social studies and that "numbers" were not limited to the field mathematics. Finally, it is likely that exposure to numerical data via the classroom exercises suggested by some of the authors contributing to the bulletin would have encouraged students of the social studies to be more comfortable with, and perhaps become more facile with, the use of numbers, numerical data, and statistics as they applied to the disciplines of the social studies.

H. Michael Hartoonian, professor of social studies education at the University of Wisconsin-Madison, contributed an article entitled "Social Mathematics". Hartoonian understood the role that mathematics and statistics should play in the civics classroom and defined the term to include:

> …abilities that are used when we measure or quantify social phenomenon in any way and communicate these measures to others, plus those related abilities that we need when judging the information presented to us as we decide whom to vote for, what car to purchase, or what personal economics course to follow…[it] helps us solve problems and make decisions in the face of uncertainties because of incomplete information. (1989, p. 51)

Hartoonian's vision of social mathematics was appealing. He asserted that many of the skills should be taught through a hands-on, problem-based approach to learning. In one example, Hartoonian suggests that rather than having students learn percentages, ratios, and graphing skills via more traditional forms of instruction (e.g. lecture or worksheet), students should be given the opportunity to work with real social data from their community. In Hartoonian's example, students would perform every task from deciding what social data was relevant to their particular study to obtaining that data and graphing it mathematically and visually.

By 1991, a second article entitled "The Case For Social Mathematics" appeared in NCSS Bulletin Number 3 – this time written by Hartoonian and two colleagues from the University of Wisconsin, Green Bay. Hartoonian, Laughlin, and Sanders echoed Hartoonian's earlier call for the inclusion of social mathematics in the social studies curriculum in general and the civics curriculum in particular:

> The primary goal of social studies continues to be to prepare students to be informed citizens by introducing them to the structure, concepts, and skills of the social science disciplines. This goal can be met with greater success and a higher level of sophistication of (sic) students have opportunities to learn and use more statistical analysis in making personal and social decisions. Various statistical procedures have become important and will continue to be valuable lifelong social studies skills. (p. 75)

What was new in "The Case For Social Mathematics" was that some of the authors emphasized the inability of the civics textbook to address the skills students would need to become effective citizens. This emphasis was in keeping with the promise that computer hardware and software held for revolutionizing instruction. The first problem with the civics textbook, according to the authors, was that too often it contained a small number of graphs and charts that were only included because they visually supported the author’s claim. Social studies students were not asked to draw their own inferences or conclusions based upon the information presented – the students were, as the authors put it, “…the consumers of information rather than the producers of inferences and generalizations” (Hartoonian, et. al, 1991, p.73). The second problem the authors had with the traditional civics textbook was that, unlike computers and computer programs, textbooks could not be kept current without an unreasonable expenditure of money. An added benefit of computer hardware and software was that it could provide the social studies teacher with updated quantified information and the ability to research, manipulate, and draw inferences from the data via various statistical tools included with most computer software applications.

In addition to advocating a greater role for computers in the social studies classroom, the authors broadened the definition of social mathematics:

> Social mathematics includes the study and use of statistics as applied to the social world. It includes the skills to collect, quantify, and measure data; to judge the quality of the data; and to communicate these measures to others. The use of social mathematics helps us to solve problems and make decisions which influence the quality of our life. Examples of mathematics concepts useful in social studies include probability, percent, ratio, index, central tendency, mean, median, mode, range, and sampling. (Hartoonian, et. al, 1991, p. 75)

In the attempt to develop a more precise definition of social mathematics, it was also instructive to view social mathematics through the eyes of mathematicians. One of the interesting aspects of the argument to include more mathematics and statistics instruction in civic education is that it has historically enjoyed the support of members of the mathematics and social studies community. Several mathematicians, statisticians, and mathematics educators have perceived a need to include instruction in mathematics and statistics as they apply to civics education. Although they use terms other than *social mathematics* to describe the conjoining of mathematics and civics, some mathematics educators, statisticians, and mathematicians have, and continue to advocate for, the same instruction in concepts and skills as some social studies educators.

Contemporarily speaking, few advanced the argument for equipping American citizens with statistical understanding and skills better than mathematician John Allen Paulos, via his nationally best-selling book *Innumeracy* (1988). *Innumeracy* was a work that probed the myriad of ways intelligent people misinterpret data and statistics, sometimes with humorous consequences, but other times very serious ones. Paulos addressed numerous examples of mathematics and statistics that could be found in daily life and illustrated how a lack of mathematical understanding (or "innumeracy") can negatively impact our personal and professional lives. Paulos' message was that representing information statistically had become the norm and that these statistics needed interpretation. It is within this process of interpretation and/or re-interpretation that problems can occur, problems that result because of a lack of understanding of statistics or as a result of deliberate attempts to skew data and information. Innumeracy has consequences, many we did not know and more still that we underestimate.

In 1995, Paulos wrote *A Mathematician Reads The Newspaper* as a follow-up to *Innumeracy*. Paulos used *A Mathematician Reads The Newspaper* to further illustrate the link between statistical understanding and the majority of social, political, legal, and economic issues reported in the daily newspaper. A lack of public numeracy regarding these issues, according to Paulos, can and often does result in citizens making poor and costly choices and decisions on a wide range of personal and professional matters. Paulos also clearly expressed that there exists a social cost to innumeracy and that these social costs to be endured by the American taxpayer more than subtly suggested a need to teach statistically competent students:

> The social cost of our mathematical naiveté is harder to measure (although I try in this book), but gullible citizens are a demagogue's dream. Charlatans yearn for people who can't recognize trade-offs between contrary desiderata; who lack a visceral grasp of the difference between millions of dollars for the National Endowment for the Arts and hundreds of billions of dollars for the savings-and-loan bailout; or who insist on paralyzing regulation of rare and miniscule health risks, whose cumulative expense helps to ensure the incomparably greater health hazard of poverty…almost every political issue - health care, welfare reform, NAFTA, crime-has a quantitative aspect. (pp. 165-166)

Paulos' book not only stirred the interest of the general public concerning statistical illiteracy, it also introduced a new term to the American vocabulary. "Even the word 'numeracy'," wrote mathematician Lynn Arthur Steen in *Mathematics and Democracy: The Case For Quantitative Literacy (2001)* "is relatively new in the American lexicon. Indeed, the first widespread use of the term in the United States was somewhat indirect, being encapsulated in its negation: *Innumeracy* – John Allen Paulos' surprisingly popular outcry against quantitative illiteracy" (p. 110). Steen's attention to the detail that Paulos was the first to introduce both innumeracy and numeracy to an *American* audience is a nod to the British, who defined the term in 1982: We would wish the word numerate to imply to the possession of two attributes. The first of these is an "at homeness" with numbers and an ability to make use of mathematical skills which enables an individual to cope with the practical demands of everyday life. The second is an ability to have some appreciation and understanding of information which is presented in mathematical terms. (Cockcroft, p. 7)

Iddo Gal, a cognitive psychologist at the University of Haifa, Israel, offered another definition of numeracy. Gal broadened both the attributes of numeracy and the idea of an at homeness alluded to earlier by the British:

> We use numeracy to describe an aggregation of skills, knowledge, beliefs, dispositions, habits of mind, communication capabilities, and problem-solving skills that people need to autonomously engage in and effectively mange situations in life and at work that involve numbers, quantitative or quantifiable information, or textual information that is based on or has embedded in it some mathematical elements. (1997, p. 39)

These definitions of numeracy make use of the word skills and convey a sense that being numerate involves utilizing quantitative skills in practical, real life situations. What is also interesting about Gal's 1997 definition is that it does not differentiate between skills and "…knowledge, beliefs, dispositions, habits of mind, communication capabilities…" (1997, p. 39) – which suggests that each of us will bring to bear our own experiences on the question to be asked, the decision to be made, and the problem to be solved. If this is true, then statistical skills as they apply to civics education can perhaps be understood as a form of personal literacy.

This notion of *quantitative* or *mathematical literacy* is enticing. Though the latter term has fallen out of vogue, quantitative literacy has proven to be an enduring term that has emerged as the term of choice among many of the mathematicians and mathematics educators who write and lecture on the subject of equipping citizens with more mathematical and statistical understandings and skills. The term quantitative literacy was first defined in the National Adult Literacy Survey of 1993 as:

> The knowledge and skills required to apply arithmetic operations, either alone or sequentially, using numbers embedded in printed material (e.g., balancing a checkbook, completing an order form). (Steen, 2001, p. 7)

This short and simple definition establishes an association between being knowledgeable and skilled in the application of arithmetic operations and a form of literacy. The notion of "using numbers embedded in printed material" (Steen, 2001, p. 7) conveys this sense of literacy and draws a distinction between understanding the value and meaning of numbers printed on a page and understanding numerical data embedded within text. In *Why Numbers Count, Quantitative Literacy For Tomorrow's America*, seventeen scholars who called themselves the Quantitative Literacy Design Team further developed the concept of literacy as they understood it to apply to quantitative skills and reasoning. The team identified ten attributes of a quantitatively literate person:

1. A person who exhibits confidence in applying mathematics, a confidence that is in direct contrast to one who is a self-described "*mathophobe*".

2. A person with an appreciation of the history of mathematics and its role in advances in science and technology.

3. A person who can understand and manipulate numerical data.

4. A person who thinks, analyzes and reasons in a logical manner.

5. A person capable of making informed, well-reasoned and logical decisions.

6. A person who understands how and when to employ mathematics in specific settings.

7. A person who demonstrates common sense and accurate intuition regarding numbers and numerical meaning.

8. A person knowledgeable in how to use mathematics, mathematical operations and reasoning to solve "every day" problems.

9. A person who knows how to apply more advanced forms of mathematics in postsecondary education.

10. A person comfortable with and knowledge of operational symbols. (Steen, 1997, pp. 8-9)

How do all of these definitions help to develop the definition of social mathematics offered at the beginning of this chapter? What attributes of these definitions deserve inclusion in the definition of social mathematics and why do they deserve to be included? What attributes of these definitions deserve to be rejected in the revised definition of social mathematics and why do they deserve to be rejected? A decision was made to begin with Hartoonian, Laughlin, and Sander's definitions of social mathematics as a basis for establishing a revised definition of the term. The focus then became to examine definitions of social mathematics, numeracy, and quantitative literacy in order to draw comparisons and distinctions between them. A rationale follows as to how the definition of social mathematics that appears at the beginning of this chapter was developed.

It is clear that the definitions of social mathematics offered by Hartoonian and other social studies educators encompass many of the same ideas, skills, and themes as those definitions of numeracy and quantitative literacy offered by Paulos, Steen, and other statisticians, mathematicians, and mathematics educators. All believe that ordinary citizens must apply mathematical and statistical knowledge and skills in everyday contexts such as making informed decisions and solving problems, and all who argue for the inclusion of more mathematical and statistical instruction in civics, regardless of their academic background, do so out of growing concern over the fate of the numerically illiterate citizen.

There are several additional commonalities between definitions that deserve attention. First, Rosander's (1937) stated purpose for his course in social mathematics certainly is a harbinger of Hartoonian, Laughlin, and Sander's definition of the term. All expressed concern that students are able to examine sources of information for bias, as well as be able to analyze and interpret data. Cockcroft's 1982 definition of numeracy focused on the dual attributes of being able to employ mathematical skills to solve everyday problems and to be able to understand information presented in a quantified format.

There also exist several significant differences among the definitions detailed within this chapter. Rosander's stated purpose for social mathematics and Cockcroft's definition of numeracy failed to overtly embrace the civic implications of a citizenry that is innumerate or fails to understand the fundamental precepts of social mathematics. Seven (numbers 3, 4, 5, 6, 7, 8) of the ten attributes of a quantitatively literate person, as identified by the Quantitative Literacy Design Team, are very much in keeping with

Hartoonian, Laughlin, and Sander's concept of social mathematics. The remaining three (numbers 1, 2, 9) are too grounded in substantial mathematical study to warrant inclusion in a definition of social mathematics that attempts to directly address the needs of the average citizen. This is perhaps not unexpected, as the majority of members of the Quantitative Literacy Design Team have an academic or professional background in statistics, mathematics, or the sciences.

The most significant and important difference between the way Hartoonian and other social studies educators define this meeting of mathematics and statistics with civics and the way in which Paulos, Steen, Gal, and other mathematicians, statisticians, and mathematics educators define this same intersection lies in the notion of *literacy*. Hartoonian, Laughlin, and Sanders write of "…the study and use of statistics as applied to the social world…the skills to collect, quantify, and measure data; to judge the quality of the data, and to communicate these measures to others" (Hartoonian, et. al, 1991, p. 75). Their definition of social mathematics does not seem to embrace the core concepts of understanding social mathematics as a literacy, as an ability to read, recognize, analyze, and interpret numbers embedded in text. This notion of social mathematics as not only reflecting a mathematical and statistical ability, but a literary ability as well, is an important contribution to the definition of the term. Students of the social studies need to be able to use mathematical and statistical terms, concepts, and skills in a variety of common contexts such as reading a newspaper, understanding a candidate's position statement or voting record, or calculating which home mortgage option choice makes the most sense.

An analysis of the similarities and differences in the definitions of social mathematics, numeracy, and quantitative literacy aided substantially in the development of the revised definition for social mathematics. The core components of social mathematics, numeracy, and quantitative literacy are all reflected in the revised definition of social mathematics presented earlier. Gal, Steen, and others' assertions that applying mathematical and statistical concepts and skills to address everyday problems is a type of literacy is also present in the revised definition. The resulting definition represents substantial common ground upon which mathematicians, mathematics educators, statisticians, and social studies educators can find firm footing.

The revised definition of social mathematics is not the only benefit of the historical study conducted as part of the overall analysis of how the official curricula of civics recognizes social mathematics. A second benefit of this historical study is that it helped to identify *that it is within the discipline of civics that the concepts and skills of social mathematics need to be fully explored*. Social mathematics can and indeed does inform (and is an integral part of) the other disciplines of the social studies, but it must be understood that those disciplines provide their own context to learning and applying the concepts and skills of social mathematics. The discipline of civics must provide a civic or citizenship context in which to learn about and apply social mathematics. There is contemporary support in the social studies students education community (Hartoonian, Laughlin, and Sanders) and in the mathematics education community (Paulos and Steen) for this conclusion. This historical review, therefore, establishes the questions to be undertaken for the descriptive analysis:

How are the calls for social mathematics represented in the current curricula of civics – national standards, state standards, and nationally marketed textbooks?

Chapter 3

Methodology

> Two grand forces shape the textbook business (a $4.5 billion business, by one estimate). On one side are a small handful of publishers: Glencoe/McGraw-Hill, Harcourt (part of Reed Elsevier Group), Houghton Mifflin (a division of Vivendi), and Pearson Education (a wing of the media company of the same name, with divisions that include Prentice Hall). On the other side are the state commissions that make decisions about which textbooks those states will buy for their school systems.
>
> - Walker, 2002, p. 1

In this chapter, I provide an explanation of the methodologies employed in this study. First, I explain why an examination of the national standards for social studies and civics is critical to providing a more complete context for understanding how the field of social studies recognizes the importance of social mathematics. I provide the same type of analysis for the state social studies standards of California, Texas, and Florida, and a rationale for why these three sets of state standards were chosen for consideration. Next, I provide a rationale for examining the social studies courses offered, and social studies texts used, by the states of Texas and Florida, and by the Los Angeles Unified School District. Finally, I present an explanation and rationale for how the tool of analysis (in this case a rubric based upon the definition of social mathematics offered in the previous chapter) was developed and how it will be applied to national and state standards, as well as to a nationally marketed civics textbook.

Based upon the review of the literature conducted for the previous chapter, there exists substantive support for including social mathematics in social studies education in general and in civics education more specifically. The critical question for this study is ***how*** *has the representation of the call for social mathematics manifested itself in the* *curricula of civics – national social studies standards, state social studies standards, and in a nationally marketed textbook?*

Why National and State Standards Deserve Consideration

The curriculum of civics, like many other discipline-specific curricula, presents itself in national standards, state standards, and nationally marketed textbooks. The first of these, national standards, are easily identified. The National Council for the Social Studies (NCSS) publishes a list of ten general content standards for teachers and students of the social studies. In addition, the NCSS recognizes the Center for Civic Education (CCE) as the body to publish national standards for civics education. An analysis of the national standards published by both of these organizations is conducted because it stands to reason that states, school districts, textbook publishers, and teachers are very much aware of the national standards concerning their discipline.

The second layer of official curricula of the social studies assumes the form of state content learning standards in social studies. This second strata of curricula is important to analyze for several reasons, not the least of which is that state content standards are followed by teachers who practice their profession within that state. The national standards offered by the National Council for The Social Studies and the Center for Civic Education are, while influential on policy and practitioners, completely voluntary. Neither states nor teachers are required to follow the standards of either organization. It is also important to analyze state content standards in social studies education because they generally reflect greater specificity and depth than do the national social studies content standards. Finally, it is important to analyze state social studies content standards because they may reveal treatments of social mathematics that differ from national content standards or from the content of nationally-marketed textbooks.

It would be difficult to analyze the social studies standards published by all fifty states, especially as a single component of a multi-faceted study. There exists a need to narrow the focus of the research to the content standards of a few states to make the research more manageable. Is it possible to make the research more manageable by selecting a sample of state social studies content standards to examine, *while at the same time selecting states whose decisions concerning what to address (and what not to address) in their state social studies content standards might have a broader impact upon school districts and teachers beyond the state's boarders*? It is the peculiar relationship that exists between nationally marketed civics texts and a small handful of states with large public school populations that helps to narrow the focus of the research and analysis to be conducted in this study.

Why Nationally Marketed Civics Texts Are Significant

While there exists national standards for the social studies and for the specific content area of civics, there does not exist a "national" civics textbook. Identifying which civics text is most widely used in American schools can be difficult. One factor that complicates such precise identification is that there does not exist a national best-seller list for textbooks. Compounding this difficulty is the understandable reality that textbook publishers have been known to inflate sales figures of a popular text as a marketing tool (Walker, 2002). It therefore is impossible to rely on textbook publishers' sales figures, even if they are willing to provide those figures. Many do not.

One accepted method of determining a textbook's popularity is to determine which texts are used in the largest of textbook adoption states. A textbook adoption state is any state that adopts textbooks for use in all of that state's school districts. Many states do not adopt textbooks on a statewide basis. In fact, the majority of states in the United States leave textbook selection and adoption up to individual districts within the state. In the state of Pennsylvania, for example, 501 different school districts in the commonwealth make their own decisions regarding which textbooks to adopt. Most of these districts leave these decisions up to individual buildings and, in some cases, individual teachers (PDE, 2005).

There is, however, a number of states that do adopt texts for use in school districts within its borders. A benefit of examining those texts used by the largest of the textbook adoption states is that many of these states serve some of the largest public school populations. Another benefit of examining texts used by the largest of the textbook adoption states is that the largest of these states – California, Texas, Florida, and North Carolina – may actually drive the content of textbooks. Conventional wisdom suggests that California, Texas, Florida, and North Carolina are substantial and crucially important markets for textbook publishers. Publishers are keenly aware that they need to tailor the content of their textbooks to meet the needs of their largest clients. These needs, of course, are represented within the state's content standards. These four states alone represented nearly *a third of all textbook sales* in the United States in 1998, the last year such figures are available (Jones, 2000). To gain and maintain a sizable portion of the estimated *5 billion dollar* pie, textbook publishers need to produce textbooks with content that mirrors the state content standards of their largest clients (Jones, 2000). There exists, then, a particularly unique relationship between the state standards of the largest textbook markets and the content of those textbooks. For this study, this relationship can be exploited.

First, I scrutinized Jones' (2000) assertion that California, Texas, Florida, and North Carolina represent the four largest textbook adoption states. According to the latest available figures from the United States Department of Education (2002), California served more public school pupils (over six million) than any other state in the United States. Texas ranked second in the nation, serving a public school population in excess of four million. New York and Florida are ranked third and fourth, respectively, separated by fewer than a half a million pupils. North Carolina is ranked eleventh in the nation (1,293,638), preceded by Illinois (2,048,792), Ohio (1,835,049), Pennsylvania (1,814,311), Michigan (1,743,337), Georgia (1,444,937), and New Jersey (1,307,828). Since the states of New York, Illinois, Ohio, Pennsylvania, Michigan, Georgia, and New Jersey do not adopt textbooks on a statewide basis, Jones' assertion appears to be accurate. Upon further analysis, however, Jones' assertion is not *entirely* accurate. There are several factors that make it impossible, at least for the purposes of this study, to rely on California, Texas, Florida, and North Carolina as the four textbook adoption states from which substantive conclusions can be drawn concerning the treatment of social mathematics in the standards and texts adopted by these states.

California, by far the nation's largest textbook adoption state, only adopts texts statewide for grades K through 8. For grades 9 through 12, Larry Dunn stated that the California Department of Education allows individual school districts to make their own decisions regarding textbook adoption (CDE, 2001). Technically speaking, then, California is not a statewide textbook adoption state when it comes to these four grades. After the focus and intent of this study was described to him, Larry Dunn of the California Department of Education (2001) strongly suggested that the Los Angeles Unified School District be used as an example. As Mr. Dunn explained, the Los Angeles Unified School District is by far the largest school district within the state, serving more than 12% of the school age population attending public schools in California. Moreover, records from the United States Department of Education show that the Los Angeles Unified School District serves more students than twenty-nine individual *states* in the United States. This is significant because, as Mr. Dunn suggested, not only is the Los Angeles Unified School District the largest school district in the state, but because of the size and influence the district enjoys, most of California's other school districts follow the Los Angeles Unified School District's choices for textbooks.

The states of Texas and Florida do adopt textbooks on a statewide basis for all grades and all disciplines. The case of North Carolina is considerably more problematic. While the state does adopt texts for most grades and disciplines, North Carolina will not adopt social studies textbooks until 2006 at the earliest, according to their web page. While Jones was correct in her assertion that North Carolina is the fourth largest textbook adoption state, North Carolina was dropped from consideration for this study for this reason.

The Text To Be Analyzed In This Study

If Jones' assertion that California, Texas, Florida, and North Carolina wield substantial influence in what is included and excluded in nationally marketed textbooks, then it stands to reason that Texas, Florida, and the Los Angeles Unified School District wield substantial power and influence over publishers of nationally-marketed civics textbooks. An examination of the texts used by Texas, Florida, and the Los Angeles Unified School District is therefore critical to developing an understanding of how social mathematics is recognized in the nation's leading civics text. The entries in bold print to be found in Table 3.1 represent the titles of the texts used in various social studies courses offered by California, Florida, and Texas that represent those courses that most substantively deal with issues of civics, government, citizenship, political science, and democracy.

How was it determined that certain social studies courses offered in middle and secondary schools across California, Texas, and Florida represent the greatest opportunity to discover instruction, problems, activities, and reading that potentially involve the concepts and skills of social mathematics as they apply to civics education and why is this determination important? The course descriptions of every social studies course offered in grades 5 through 12 were obtained from the state departments of education of California, Texas, and Florida. I read all of these course descriptions carefully to determine which courses represent those courses that most substantively deal with issues of civics, government, citizenship, political science, and democracy. In the case of Texas, Florida, and the Los Angeles Unified School District, one course is offered to address these and other subjects related to civic participation. In Texas, this required course is entitled *United States Government*. School districts within the state of Texas may opt to offer *United States Government* in the ninth, tenth, eleventh, or twelfth grade. In Florida, *Political Science* is a required course that can be offered in either the sixth, seventh, or eighth grades, and is required again in the ninth, tenth, eleventh, or twelfth grade. Like the state Texas, it is up to individual school districts within the state of Florida to decide in which grade to offer *Political Science*. This second course in political science is a departure from the earlier *Political Science* course to avoid repetition of content and to provide older students with instruction in more advanced concepts and skills. The Los Angeles Unified School District offers *Principles of American Democracy* in grade twelve only. *Principles of American Democracy* is also a course required of all students of the Los Angeles Unified School District (as well as all public school students in California). These three courses offer the largest amounts of direct instruction in civics.

Why is it important to determine which social studies courses offered in middle and secondary schools across California, Texas, and Florida represent the greatest opportunity to discover instruction, problems, activities, and reading that potentially involves the concepts and skills of social mathematics as they apply to civics education? Recall that one of the main conclusions of the review of contemporary literature presented in chapter 2 was that most social studies educators, mathematics educators, and mathematicians agree that social mathematics was most appropriately addressed in courses dealing with issues related to American participatory civics. While the importance of mathematics and statistics to the fields of geography, economics, psychology, sociology, and many of the other disciplines of the social studies is not in question, what is in question is the level of representation and support for social mathematics specifically within the discipline of civics.

In summation, Texas, Florida, and the Los Angeles Unified School District present a unique opportunity for the purposes of this study. First, all three represent the

Table 3.1

	California (LAUSD)	*Florida*	*Texas*
Grade 6	No civics-related course is Required in this grade	**Glencoe - <u>Civics: Responsibilities and Citizenship</u>** **HRW - <u>American Civics</u>** **Prentice Hall - <u>Civics: Participating in Government</u>**	No civics-related course is Required in this grade
Grade 7	No civics-related course is Required in this grade	Civics-related course optional in this year (see Grade 6)	No civics-related course is Required in this grade
Grade 8	No civics-related course is Required in this grade	Civics-related course optional in this year (see Grade 6)	No civics-related course is Required in this grade
Grade 9	No civics-related course is Required in this grade	**Glencoe - <u>US Government: Democracy in Action</u>** **HRW - <u>Holt American Government</u>** **Prentice Hall - <u>Magruder's American Government</u>** **NTC/Contemporary Pub - <u>West's American Government</u> McDougal Littell - <u>American Government</u>** **Prentice Hall - <u>Government by the People</u>** **Wadsworth - <u>American Government and Politics Today</u>**	**Glencoe - <u>US Government</u>** HRW - <u>Holt American Government</u> **Pearson - <u>Magruder's American Government</u>**
Grade 10	No civics-related course is Required in this grade	Civics-related course optional in this year (see Grade 9)	**Glencoe - <u>US Government</u>** HRW - <u>Holt American Government</u> **Pearson - <u>Magruder's American Government</u>**
Grade 11	No civics-related course is Required in this grade	Civics-related course optional in this year (see Grade 9)	**Glencoe - <u>US Government</u>** **HRW - <u>Holt American Government</u>** **Pearson - <u>Magruder's American Government</u>**
Grade 12	**Prentice Hall - <u>Government by the People</u>** **McDougal Littell - <u>Government in America</u>** **HRW - <u>American Civics</u>** **HRW - <u>Holt American Government</u>** **Prentice Hall - <u>Magruder's American Government</u> Glencoe - <u>American Government</u>** **Glencoe - <u>US Government: Democracy in Action</u> Wadsworth - <u>American Government and Politics Today</u>** **McDougal Littell - <u>American Government - Institution and Policies</u>**	Civics-related course optional in this year (see Grade 9)	**Glencoe - <u>US Government</u>** **HRW - <u>Holt American Government</u>** **Pearson - <u>Magruder's American Government</u>**

most substantial markets for textbook publishers, publishers who are eager to meet the needs of their largest clients. If any state or school district wield some measure of influence over the content of civics textbooks, it would be these three. This claim is further supported by the fact that Texas, Florida, and the Los Angeles Unified School District require all public school students within their respective jurisdictions to take a course in which students have the best opportunity to work with the concepts and skills of civics, therefore it is theorized that students will have the greatest chance of working with the concepts and skills of social mathematics as they apply to civics. This combination of massive textbook adoption and required courses more than subtly suggests that if any state or school district in the United States influence the content of civics texts, it is the states of Texas and Florida, and the Los Angeles Unified School District. This conclusion is significant because it leads to the precise identification of the textbooks adopted by and used in those courses that one would reasonably expect to include the concepts and skills of social mathematics (see Table 3.1).

There are two aspects of Table 3.1 that are interesting. The first is that each course identified contains a list of textbooks. Contrary to the seemingly definitive title of "statewide textbook adoption," the textbook adoption committees of Texas, Florida, and the Los Angeles Unified School District adopt a slate of textbooks that meet state requirements and standards. Individual districts, schools, and teachers can make selections they deem appropriate for their particular students from among the list of approved and adopted texts.. Texas, Florida, and the Los Angeles Unified School District do not keep records as to *which* texts are chosen more frequently than others. The second aspect of Table 3.1 that deserves mention is the fact that *Magruder's*

American Government appears on the adopted text lists of Texas, Florida, and the Los Angles Unified School District.

The 800 Pound Gorilla

Just as California, Texas, Florida, and North Carolina are the giants of the textbook adoption states, *Magruder's American Government* has clearly positioned itself as the dominant player in an ever-shrinking league of civics texts. Called the "800 pound gorilla" by one reporter (Walker, 2002), *Magruder's American Government* is widely believed among industry analysts to have maintained at least seventy percent of the civics textbook market since it was first marketed to school districts in 1917 (Walker, 2002). If this is even close to being accurate, analyzing the *Magruder's* text poses a unique opportunity given the nature of this study.

The fact that *Magruder's American Government* appears on all three lists proves that it addresses all of the appropriate state content standards of California, Texas, and Florida (see table 3.1). It also independently supports Pearson's (the publishers of *Magruder's American Government*) assertion that *Magruder's American Government* is a "best seller" in the textbook publishing industry for two reasons. The first is that the states of Texas and Florida, along with the Los Angeles Unified School District represent a substantial market share of over 7.2 million public school students. Even considering that Texas, Florida, and the Los Angeles Unified School District together recommend eleven other textbooks for civics, it is to be expected that *Magruder's American Government* would receive a substantial share of the market. The second reason is that to be able to say that *Magruder's American Government* has been adopted by Texas, Florida, and the Los Angeles Unified School District is a powerful sales and marketing message. It is to be expected that when Pearson Education's textbook representatives sell to every other state in the nation, this fact is mentioned repeatedly.

If, as both industry analysts and Pearson Education insist, *Magruder's American Government* has held a 70% market share in every year since it's introduction in 1917, it stands to reason that the text presents a unique opportunity to find evidence of social mathematics among all civics texts. If *Magruder's* meets the state content standards of California, Texas, and Florida – content standards that may reflect instruction and practice in social mathematics – then it stands to reason that this content will be addressed by a substantial number of school districts across the nation that use the *Magruder's* text. Further, following a long-standing research process from the field of literacy called *textual redundancy*, it is assumed that if one text dominates a field so demonstrably as *Magruder's American Government*, all other texts that consume the remaining portion of the same market share will be remarkably similar in content. *Magruder's American Government* does indeed represent a unique intersection of traits that make it a particularly valuable text to analyze for this study.

Analyses of National and State Content Standards

As previously stated, I analyzed the national content standards of the National Council for the Social Studies and of the Center for Civic Education, as well as the state standards established for the individual courses of *United States Government* (Texas), *Political Science* (Florida), and *Principles of American Democracy* (California) for incidences of social mathematics (for a complete description of what this entailed, please see the next section entitled *Recognizing Incidences of Social Mathematics In Text*). I identified those national and state standards that addressed social mathematical concepts or skills. In each case, an analysis was provided that explained the rationale for the selection of the content standard, as well as how the content standard addressed tenets of social mathematics. Categories, patterns, and conclusions were drawn once every content standard that met a particular facet of social mathematics was identified within a given set of national or state standards.

The purpose of this analysis of national and state content standards was two-fold. The first purpose was to identify those national and state content standards that address concepts and skills of social mathematics. The second purpose was to evaluate how well every identified section within *Magruder's American Government* addressed those national and state content standards identified as social mathematical in nature. This would allow for the development of conclusions regarding the treatment of social mathematics within the curricula of civics.

Recognizing Incidences of Social Mathematics In Text

Whether in textbooks such as *Magruder's American Government* or in national and state content standards, it is of primary importance to be able to recognize exactly what constitutes an example of social mathematics. Recall that the revised definition of social mathematics offered in the second chapter of this dissertation reflects an *active* use of mathematics and statistics on the part of students of civics as a means to make sense of a world that increasingly relies on numbers and statistics as a language of information. This suggests that examples of social mathematics to be found in text go beyond mere reporting of numbers, facts, and figures. Consider, for example, the following passage from *Magruder's American Government*:

> *Senator Thurmond was elected to the senate nine times, and he served there for nearly 50 years. He was elected to fill a vacancy in 1954 and won a full term in 1956. First elected as a Democrat, he became a Republican in 1964 and finally retired in 2003*. (2004, p. 277)

While there exists several numbers within this short passage, if the definition of social mathematics is applied to the passage it is clear that the numerical information presented within in it fails to qualify as an example of social mathematics. The primary reason why the passage fails to qualify as an example of social mathematics is that it does not explicitly nor implicitly ask the reader to do anything with the numeric information provided. The reader is not asked to recognize, collect, measure, judge, or analyze the numeric information presented. Further, the reader is not asked to judge, analyze, or even recognize any conclusions from the data presented or to communicate any mathematical or statistical evidence or conclusions to others. The numbers in the example are a mere reporting of factual information – nothing is to be done with the figures presented.

To determine when a passage, question, activity, or problem constitutes an example of social mathematics, the definition is applied once again to "test" a particular passage that addresses numeric or statistic information. The following two examples illustrate why it was crucial to read and evaluate every word of the text being analyzed for two reasons. First, it is important to recognize that a passage, question, activity, or problem may include numeric or statistic information not actually written numerically. Consider the following question from *Magruder's American Government*:

> *In order to expel a senator from the Senate, two thirds of the Senate must agree. Why do you think the Constitution sets such a high requirement?* (2004, p. 278)

This question, while not overtly numerical or statistical in nature, asks readers of *Magruder's American Government* to measure, judge, and analyze numeric and statistic information presented, as well as to draw some conclusions about what the information means. While numbers may not be overtly present in the preceding example, the skills of social mathematics are.

The second reason why it is crucial to read, analyze, and evaluate every word of the text is that in some cases, not only is information presented that is not written numerically, but no actual numbers are used within passages that are decidedly social mathematical in nature. Consider, for example, the following passage from *Magruder's American Government* along with its accompanying project:

> *Most professional pollsters draw a random sample, also called a probability sample. In a random sample, the pollster interviews a certain number of randomly selected people who live in a certain number of randomly selected places. A sample is thus a sample in which each member of the universe and each geographic area within it have a mathematically equal chance of being included.* (2004, p. 218)

This passage is clearly an attempt to instruct students in the use of certain mathematical and statistical terms, concepts, and skills, thereby satisfying the requirements set forth in the definition of social mathematics. Notice, however, that the passage does not include a single number or numeric information, illustrating that it is possible to find incidences of social mathematics within text that do not readily appear to be overtly mathematical in nature. Much like the passage describing what constitutes a random sample, the accompanying activity instructs students to "…design, conduct, and present the findings from a poll of your class. Create a topic, or choose from one of the following; (a) television viewing habits; (b) career plans; (c) consumption of genetically engineered foods" (McClenaghan, 2004, p. 222). Students are reminded that "…a poorly conducted poll can deliver invalid information that can mislead decision makers or can be used to make false claims. Whether a poll is nationwide or within your classroom, certain standards of poll-taking apply" (McClenaghan, 2004, p. 222). The section goes on to outline each of the five steps identified as the "standards of poll-taking": Defining the population to be polled, constructing a sample, preparing valid questions, selecting and controlling the means by which the poll will be taken, and reporting the findings. On the entire page devoted to taking a poll, not one number is evident.

While it may be apparent to some that some passages, questions, activities, and problems could ask students to work with numbers and statistics yet not be overtly mathematical or statistical in nature, it is important to recognize that this could be the case. Of course it is also true that *Magruder's American Government* presents passages, questions, activities, and problems that *are* overtly numerical and statistical in nature. Consider the following as an example:

> *This table shows the election results in the four states where the 2000 presidential race was the closest. (a) How do these results illustrate the significance of the "winner take-all" factor? (b) How did Ralph Nader's third-party candidacy affect these results?* (2004, p. 381)

The table referred to in the preceding passage depicts the popular vote, the percentage of the popular votes, the number of electoral votes, and the percentage of the total national electoral vote received by George Bush, Al Gore, and Ralph Nader in the each of the states of Florida, Iowa, New Mexico, and Oregon. This example asks students to use many concepts and skills of social mathematics to answer two very important civic questions.

Description of Analyses and Synopsis of the Study

It can be stated that there are three general types of social mathematics to be found in text (see Table 3.2). The first type represents those passages, questions, activities, and problems that make use of actual numbers. The second type represents those passages, questions, activities, and problems that express numbers and numerical information textually. The third type represents passages, questions, activities, and problems that address social mathematical skills and concepts, but do not implicitly nor explicitly use numbers to do so. All three types are designed to instruct the reader in mathematical and statistical concepts and skills, or provide realistic and practical application of these concepts and skills.

Table 3.2

Representations of Social Mathematics In Text Using Magruder's American Government as an Example

Type	Example
1. Passages, questions, activities, and problems that explicitly contain numerical data.	Interpreting Diagrams*: With a progressive income tax, the tax rate increases as total income increases. Today, federal income tax rates range from 10% to 35%. How much would this taxpayer owe with a taxable income of $37,500, which is exactly half the income in the example? (McClenaghan, 2004, p. 449) *Diagram shows the graduated (10, 20, and 30) percentages of taxable income in the $25,000 to $75,000 annual income range.
2. Passages, questions, activities, and problems that express numeric information textually	In order to expel a senator from the Senate, two thirds of the Senate must agree. Why do you think the Constitution sets such a high requirement? (McClenaghan, 2004, p. 278)
3. Passages, questions, activities, and problems that address social mathematical concepts and skills, but do not implicitly or explicitly use numbers or statistics	Most professional pollsters draw a random sample, also called a probability sample. In a random sample, the pollster interviews a certain number of randomly selected people who live in a certain number of randomly selected places. A random sample is thus a sample in which each member of the universe and each geographic area within it have a mathematically equal chance of being included. (McClenaghan, 2004, p. 218)

It is important to re-emphasize that many texts employ the use of numbers and make use of statistical information that do not satisfy the burden of proof established by the definition of social mathematics. Merely reporting that the United States Senate has one hundred members, for example, is not an example of instruction or practice in social mathematics if nothing is to be done with that information save for accepting it as fact. In this example, the fact that there are one hundred United States Senators is no more significant from a purely social mathematical perspective than the fact that the information is presented to students on page 218.

The definition of social mathematics, the examples of instruction in and application of the concepts and skills of social mathematics (Table 3.4), and the rubric that operationalizes the definition of social mathematics (Table 3.3) all provide ways to identify examples of social mathematics in text, to identify social mathematics missing in text, and to discern the relative level of quality of those examples of social mathematics. All three instruments are applied to the national standards of the National Council for the Social Studies and the Center for Civic Education, and to the state social studies standards of California, Texas, and Florida as they relate to the courses of *Principles of American Democracy*, *United States Government*, and *Political Science*, respectively. Finally, these three instruments are applied to *Magruder's American Government*, a nationally marketed civics text adopted for use statewide by all three of the aforementioned states.

A brief overview of these three instruments (the definition of social mathematics, the examples of instruction in and practice with the concepts and skills of social mathematics, and the social mathematics rubric) is warranted. First, recall that the

Table 3.3

Social Mathematics Rubric

Level	The passage, activity, problem, or question:
1	Instructs how or asks the student to identify numeric data
2	Instructs how or asks the student to translate data into numeric and statistic formats, or to translate numeric and statistic data into verbal or written formats.
3	Instructs how or asks the student to manipulate and apply provided data in a context that is also provided
4	Instructs how or asks the student to draw his own conclusions/solutions from data that is provided
5	Instructs how or asks the student to collect and analyze data not provided to draw conclusions/solutions to a provided situation or problem
6	Instructs how or asks the student to collect and analyze data not provided to draw conclusions/solutions to a situation or problem of the student's choosing

definition of social mathematics presented earlier in this work evolved from an analysis of the results of the review conducted in chapter 2. Social studies educators, mathematics educators, mathematicians, and others when describing the knowledge and abilities crucial for both individual and social survival in and of a democracy identified many of the concepts, skills, and abilities reflected within this definition of social mathematics.

The second instrument used in the analyses conducted in this study is embodied in Table 3.4, *Instruction and Practice In Social Mathematics*. Social studies educators, mathematics educators, mathematicians, and others when describing the knowledge and abilities crucial for both individual and social survival in and of a democracy identified the examples presented in this table, similar to the examples presented in the definition of social mathematics (see chapter 2). The third instrument used in the analyses conducted in this study is embodied in Table 3.3, the S*ocial Mathematics Rubric*. Similar to the definition of social mathematics and the examples of instruction in and practice with the concepts and skills of social mathematics, the social mathematics rubric developed from the historic and contemporary review of the literature pertaining to the relationship between mathematics, statistics, and civics (see chapter 2). The social mathematics rubric is designed to help determine to what degree of quality a question, passage, or activity addresses tenets of social mathematics. Depending on the text being analyzed, the levels indicated generally reflect a progression in the ability of students to work with social mathematics, or the willingness of an organization (i.e., the NCSS, the state of Texas, or Pearson Education) to challenge students to work with social mathematics through instruction, activities, or assessment. It can be generally stated that

Table 3.4

Instruction And Practice In Social Mathematics

Examples of Instruction In	Examples of Practice With
Probability and chance	Researching the topic of gambling, slot machines, and state lotteries – an important source of revenue?
Sampling and margin of error	Developing and conducting polls to determine how sampling and margin of error play roles in predicting the outcome.
Dispersion	Recognizing faulty conclusions drawn from data
Mean, median, mode, average tendency, and central tendency	Analyzing data to identify statistical outliers
Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data	Developing a trip itinerary complete with mileage, stops, time taken, gasoline costs and based upon a variety of maps, charts, and graphs.
Collecting and measuring data	Developing a profile of how local representatives voted during the year
Communicating statistical conclusions to others	Explaining the results of statistical analysis and comparisons of social data to the class.
Statistical outliers in data	Examining federal sentences for convicts to determine factors for length of incarceration
Analyzing conclusions drawn from data – whether it is the student's own conclusions or the conclusions of others	Reading newspaper and internet columns that employ statistical data to support a viewpoint and determining if all the data really supports the conclusion or points to something else
Resource management and allocation	Developing a personal budget; analyzing the budgets passed by local, state, and federal government
Understanding Interest	Choosing between savings plans and loan options
Understanding proportion	Debating different tax plans and national election plans (Electoral College, referendums, direct democracy, etc.)

Table 3.4 (cont.)

Instruction And Practice In Social Mathematics

Examples of Instruction In	Examples of Practice With
Understanding ratio and rate	Developing reapportionment maps for local political races
Drawing original conclusions from data	Developing conclusions about living in a previous century based upon local census information
Drawing original conclusions from data collected as part of an original poll, study, or project	Developing an original project that identifies a problem or issue, collecting and organizing original data, and drawing conclusions, analysis, and solutions based upon that data.
Translating written, verbal, or other forms of information into numerical and statistical formats (and the converse of this)	Translating verbal or written poll responses into a numeric summary of the results and predict actions (in statistical form) based upon those responses

lower rubric scores suggest a passage, activity, problem, or question that instructs or asks the student to work with basic social mathematical concepts and skills. These basic skills range from identifying numeric information embedded in text to translating verbal or written data into numeric or statistical formats.

It can be generally stated that rubric scores from the middle range likely incorporate concepts and skills similar to those outlined in the description of the lower range, but also ask students to work with the data in a provided context or to draw their own conclusions and develop their own solutions to a question or problem. The highest rubric scores are reserved for those passages, activities, problems, or questions that reflect the type of activities supported by Bernard Hollister and Michael Hartoonian. These activities likely include all of the concepts and skills addressed in lower rubric scores, but also require students to learn or demonstrate an ability to work with social mathematical concepts and skills outside of contexts provided by the textbook or teacher. Students would develop and work with data or problems that they themselves provide or pose.

These three instruments were used in concert to analyze the national social studies standards published by the National Council for the Social Studies, the national civics standards published by the Center for Civic Education, and the state social studies standards of California, Texas, and Florida as they apply to the courses of *Principles of American Democracy*, *United States Government*, and *Political Science*. These three instruments described in the preceding paragraphs were also applied to *Magruder's American Government*, the example of a nationally marketed civics text. All of the analyses conducted as part of this study were to ultimately answer the question posed at the inception of this study: *How are the calls for social mathematics represented in the current curricula of civics – national standards, state standards, and nationally marketed textbooks?*

Chapter 4

National Civics Standards

> The twenty-first century will bring us face to face with the information-electronic-biotechnological age. New issues, together with old problems, will confront us and tax our intellectual and moral fiber, making it increasingly difficult to implement the goals that define us as a nation. Demographic and statistical data force us to look closely at the changing nature of our families, the reconceptualization of work, the distribution of justice and poverty, the conditions of illiteracy, and the age, class, gender, and ethnic makeup of our people. The world is diverse, ethically challenged, yet globally interdependent, and the task of "bringing the blessing of the American dream to all" calls for citizens with a new sense of purpose.
>
> \- *Hartoonian, 1994,* Preface to the *NCSS Curriculum Standards for Social Studies*

Introduction

In this chapter, I present an overview of the role that the National Council for the Social Studies (NCSS) plays in identifying national standards for social studies education as well as the role it plays in identifying and supporting the national standards published for civics and government by The Center for Civic Education. The national standards published by both organizations are analyzed to determine their treatment of the concepts and skills of social mathematics. Conclusions are drawn regarding if, and to what degree, national standards in social studies education and national standards in the specific discipline of civics reflect the concepts and skills of social mathematics.

The NCSS and Civics Standards

With a membership of over 25,000, The National Council for the Social Studies is arguably the most recognized national organization that promotes social studies education in American schools. In 1994, the NCSS published *Expectations of Excellence: Curriculum Standards for Social Studies*. This document, and the standards contained within, was a response to the *Goals 2000: Educate America Act*. The Educate America Act, passed by Congress in 1992, was an attempt by Congress to encourage various educational organizations to develop national standards in individual disciplines. These standards were published and disseminated to states for inclusion in their public education agenda and policies. When Congress, through the Educate America Act, identified the disciplines of the arts, civics and government, vocational education, economics, science, English, physical education, foreign language, geography, history, and mathematics as *the* disciplines for which national standards should be developed, some in the social studies community felt left out of the process. The response of the NCSS was to push for recognition that, although the social studies combine many of the individual disciplines recognized by Congress through the Educate America Act, the social studies itself was a distinct discipline of study. The efforts of the NCSS leadership and membership were eventually successful, ultimately leading to the development and publication of *Expectations of Excellence: Curriculum Standards for Social Studies*.

The *Executive Summary*, found in the opening pages of *Expectations of Excellence: Curriculum Standards for Social Studies*, attempts to explain the relationship between the national standards of social studies and the standards identified in the Educate America Act:

> Because educational standards are being developed both in the social studies and in many of the individual disciplines that contribute to the social studies, one might ask: what is the relationship among these various sets of standards? The answer is that the social studies standards address overall curriculum design and comprehensive student performance expectations, while the individual discipline standards (civics and government, economics, geography, and history) provide focused and enhanced content detail. Teachers and curriculum designers are

encouraged first to establish their program frameworks using the social studies standards as a guide, and then to use the standards from history, geography, civics, economics, and others to guide the development of grade level strands and courses. (1994, pp. vii-ix)

The notion that the NCSS task force views the standards published in *Expectations of Excellence: Curriculum Standards for Social Studies* as addressing the overall curriculum design is readily apparent. *Expectations of Excellence: Curriculum Standards for Social Studies* contains “The ten themes that form the framework of the social studies standards…” (1994, p. x). Clearly the NCSS conceptualizes their standards as *directing or composing* the national standards of the other disciplines that the NCSS identifies as comprising the social studies. In fact, this analogy of *composing* is actually used by the NCSS task force to explain this relationship among the standards. The NCSS task force views the NCSS standards as the overall composition and the disciplines of the social studies as the orchestra that is to play the composition (1994).

The ten themes identified by the NCSS include (pp. x-xii):

1. Culture
2. Time, Continuity, and Change
3. People, Places, and Environments
4. Individual Development and Identity
5. Individuals, Groups, and Institutions
6. Power, Authority, and Governance
7. Production, Distribution, and Consumption
8. Science, Technology, and Society

9. Global Connections

10. Civic Ideals and Practices

These 10 themes are defined quite broadly, in keeping with the idea that their purpose is to assist schools and teachers in developing *curricular frameworks* for the social studies. Since the purpose of this study is to identify and describe how the national curricula of civics has responded to the historical call for the inclusion of mathematics and statistics (social mathematics) in civic education, all 10 themes were first carefully analyzed to determine if any directly or indirectly address civics. Once those themes that directly or indirectly address civics were identified, all of the *performance expectations* aligned with each of the identified themes was analyzed for direct or indirect references to the concepts and skills of social mathematics.

I selected three of the ten themes for further analysis: *Power, Authority, and Governance* (theme 6), *Science, Technology, and Society* (theme 8), and *Civic Ideals and Practices* (theme 10). I selected these three themes from among the ten themes because all three directly or indirectly addressed concepts and skills aligned with civics. To facilitate a more in-depth analysis of these three identified themes, the language used in the performance expectations that the NCSS aligns with each theme was analyzed for incidences of words or phrases that could be interpreted as addressing the concepts and skills of social mathematics. The results of these analyses are reflected in Tables 4.1 through 4.6, tables that categorize the performance expectations of the three themes among 4 categories that are used throughout this study. The first, Category 1, includes those performance expectations that do not directly nor indirectly address the concepts and skills of social mathematics. Category 2 reflects those performance expectations that, while possibly addressing concepts and skills of social mathematics in an indirect manner, are not likely to be interpreted as doing so by the authors and consumers of the performance expectations in question. Category 3 includes those performance expectations that are likely to be interpreted by the authors and consumers of the performance expectation in question as addressing concepts and skills of social mathematics. Category 4 includes those performance expectations that directly address the concepts and skills of social mathematics through clear and unambiguous language.

NCSS Theme 6

Theme 6, *Power, Authority, and Governance*, speaks of "…developing civic competence," "decision-making," and "problem solving" and was therefore identified for further analysis (NCSS, 1994, p. 26). Theme 6 appears below:

> Understanding the historical development of structures of power, authority, and governance and their evolving functions in contemporary U.S. society, as well as in other parts of the world is essential for developing civic competence. In exploring this theme, students confront questions such as: What is power? What forms does it take? Who holds it? How is it gained, used, and justified? What is legitimate authority? How are governments created, structured, maintained, and changed? How can we keep government responsive to its citizens' needs and interests? How can individual rights be protected within the context of majority rule? By examining the purposes and characteristics of various governance systems, learners develop an understanding of how groups and nations attempt to resolve conflicts and seek to establish order and security. Through the study of the dynamic relationships among individual rights and responsibilities, the needs

> of social groups, and concepts of a just society, learners become more effective problem-solvers and decision-makers when addressing persistent issues and social problems encountered in public life. They do so by applying the concepts and methods of political science and law. In schools, this theme typically appears in units and courses dealing with government, politics, political science, history, law, and other social sciences. (1994, p. 26)

In order to determine how the concepts and skills of social mathematics are reflected in theme 6, an analysis of the performance expectations linked to this particular theme was conducted. Performance expectations are important because they identify the precise knowledge and skills students of civics are to exhibit as a result of addressing a major theme. Because of this, the performance expectations hold the added benefit of being more specific than the general themes in terms of identifying more specific examples of the concepts and skills students should learn and be able to apply. Table 4.1 (middle school performance expectations) and Table 4.2 (high school performance expectations) depict the result of the analysis conducted.

NCSS Theme 8

The second theme identified for further analysis was Theme 8, *Science, Technology, and Society.* This theme speaks of "…coping with the ever-increasing pace of change…" and "…[managing] technology so the greatest number of people benefit from it" (1994, p. 28). This theme was identified for further analysis because it seems to reflect some of the civic concerns echoed by Hartoonian and Paulos regarding the need for American citizens to be more capable in applying mathematics and statistics in "everyday" situations. Theme 8 appears below:

Table 4.1

An Analysis of the Middle Grade Performance Expectations for Theme 6 of the NCSS Standards: Power, Authority, and Governance (p. 94)

Category 1	Category 2	Category 3	Category 4
a. examine persistent issues involving the rights, roles, and status of the individual in relation to the general welfare	h. explain and apply concepts such as power, role, status, justice, and influence to the examination of persistent issues and social problems	c. analyze and explain ideas and governmental mechanisms to meet needs and wants of citizens, regulate territory, manage conflict, and establish order and security	
b. describe the purpose of government and how its powers are acquired, used, and justified		f. explain conditions, actions, and motivations that contribute to conflict and cooperation within and among nations	
d. describe the ways nations and organization respond to forces of unity and diversity affecting order and security		g. describe and analyze the role of technology in communications, transportation, information-processing, weapons development, or other areas as it contributes to or helps resolve conflicts	
e. identify and describe the basic features of the political system in the United States, and identify representative leaders from various levels and branches of government			
i. give examples and explain how governments attempt to achieve their stated ideals at home and abroad.			
55.5%*	11.1%*	33.3%*	0%

*Because of rounding, percentages may not add up to 100%

> Technology is as old as the first crude tool invented by prehistoric humans, but today's technology forms the basis for some of our most difficult social choices. Modern life as we know it would be impossible without technology and the science that supports it. But technology brings with it many questions: Is new technology always better than that which it will replace? What can we learn from the past about how new technologies result in broader social change, some of which is unanticipated? How can we cope with the ever-increasing pace of change, perhaps even with the feeling that technology has gotten out of control? How can we manage technology so that the greatest number of people benefit from it? How can we preserve our fundamental values and beliefs in a world that is rapidly becoming one technologically linked village? This theme appears in units or courses dealing with history, geography, economics, and civics and government. It draws upon several scholarly fields from the natural and physical sciences, social sciences, and the humanities for specific examples of issues and the knowledge base for considering responses to the societal issues related to science and technology. (1994, p. 28)

Similar to the analysis conducted for theme 6, the performance expectations aligned with theme 8 were analyzed for direct or indirect references to the concepts and skills of social mathematics. The results of this analysis are depicted in Table 4.3 (middle school performance expectations) and 4.4 (high school performance expectations).

Table 4.2:

An Analysis of the High School Performance Expectations for Theme 6 of the NCSS Standards: Power, Authority, and Governance (p. 127)

Category 1	Category 2	Category 3	Category 4
a. examine persistent issues involving the rights, roles, and status of the individual in relation to the general welfare	b. explain the purpose of government and analyze how its powers are acquired, used, and justified	c. analyze and explain ideas and mechanisms to meet needs and wants of citizens, regulate territory, manage conflict, establish order and security, and balance competing conceptions of a just society	
e. compare different political systems (their ideologies, structure, institutions, processes, and political cultures) with that of the United States, and identify representative political leaders from selected historical and contemporary settings	d. compare and analyze the ways nations and organizations respond to conflicts between forces of unity and forces of diversity	f. analyze and evaluate conditions, actions, and motivations that contribute to conflict and cooperation within and among nations	
	i. evaluate the extent to which governments achieve their stated ideals and policies at home and abroad.	g. evaluate the role of technology in communications, transportation, information-processing, weapons development, or other areas as it contributes to or helps resolve conflicts	
	j. prepare a public policy paper and present and defend it before an appropriate forum in school or community.	h. explain and apply ideas, theories, and modes of inquiry drawn from political science to the examination of persistent issues and social problems	
20%*	40%*	40%*	0%

*Because of rounding, percentages may not add up to 100%

NCSS Theme 10

The third theme identified for further analysis was Theme 10, *Civic Ideals and Practices.* The title of this theme suggests support for instruction in and practice with knowledge and skills of civics and citizenship. Theme 10 appears below:

> An understanding of civic ideals and practices of citizenship is critical to full participation in society and is a central purpose of the social studies. All people have a stake in examining civic ideals and practices across time and in diverse societies as well as at home, and in determining how to close the gap between present practices and the ideas upon which our democratic republic is based. Learners confront such questions as: What is civic participation and how can I be involved? How has the meaning of citizenship evolved? What is the balance between rights and responsibilities? What is the role of the citizen in the community and the nation, and as a member of the world community? How can I make a positive difference? In schools, this theme typically appears in units or courses dealing with history, political science, cultural anthropology, and fields such as global studies and law-related education, while also drawing upon content from the humanities. (1994, p. 30)

Similar to the analysis conducted for themes 6 and 8, the performance expectations aligned with theme 10 were analyzed for direct or indirect references to the concepts and skills of social mathematics. The results of this analysis are depicted in Table 4.5 (middle school performance expectations) and 4.6 (high school performance expectations).

Table 4.3

An Analysis of the Middle Grade Performance Expectations for Theme 8 of the NCSS Standards: Science, Technology, and Society (p. 99)

Category 1	Category 2	Category 3	Category 4
c. describe examples in which values, beliefs and attitudes have been influenced by new scientific and technological knowledge, such as the invention of the printing press, conceptions of the universe, applications of atomic energy, and genetic discoveries	a. examine and describe the influence of culture on scientific and technological choices and advancement, such as in transportation, medicine, and warfare	d. explain the need for laws and policies to govern scientific and technological applications, such as in the safety and well-being of workers and consumers and the regulations of utilities, radio and television	
e. seek reasonable and ethical solutions to problems that arise when scientific advancements and social norms or values come into conflict	b. show through specific examples how science and technology have changed people's perceptions of the social and natural world, such as in their relationship to the land, animal life, family life, and economic needs, wants, and security		
40%*	40%*	20%*	0%

*Because of rounding, percentages may not add up to 100%

Tables 4.1 through 4.6 reflect similar patterns. The first is that not one of the performance expectations makes use of the words *social mathematics, mathematics, statistics, quantitative literacy*, or any similar derivations of words commonly associated with arithmetical operations. No performance expectation directly addresses any of the concepts and themes of social mathematics, and therefore not one performance expectation is classified under category 4. A second feature of Tables 4.1 through 4.6 is that some portion of the NCSS performance expectations in the middle grades and high school are identified as category 2 performance expectations. This is true across each of the three NCSS themes identified as posing the greatest chance of addressing the content and skills of civics. Recall that a category 2 performance expectation classification signifies that the performance expectation in question may indirectly address concepts and skills of social mathematics, but are not likely to be interpreted as doing so by the authors and consumers of that particular standard. An average of approximately 23.7% of the middle grade performance expectations aligned with the three NCSS themes were identified as category 2 performance expectations, while an average of approximately 32.2% of the high school performance expectations were also identified as category 2 performance expectations. This is not to say, however, that it is entirely *impossible* for an author or consumer of a given performance expectation classified under category 2 to interpret the same performance expectation as indeed addressing concepts and skills of social mathematics. Consider, for example, NCSS performance expectations b and d in Table 4.5 (1994, p. 105):

> b. identify and interpret sources and examples of the rights and responsibilities of citizens

Table 4.4

An Analysis of the High School Performance Expectations for Theme 8 of the NCSS Standards: Science, Technology, and Society (p. 132)

Category 1	Category 2	Category 3	Category 4
a. identify and describe both current and historical examples of the interaction and interdependence of science, technology, and society in a variety of cultural settings	c. analyze how science and technology influences the core values, beliefs, and attitudes of society, and how core values, beliefs, and attitudes of society shape scientific and technological change	b. make judgments about how science and technology have transformed the physical world and human society and our understanding of time, space, place, and human-environment interactions	
e. recognize and interpret varied perspectives about human societies and the physical world using scientific knowledge, ethical standards, and technologies from diverse world cultures		d. evaluate various policies that have been proposed as ways of dealing with social changes resulting from new technologies, such as genetically engineered plants and animals	
		f. formulate strategies and develop policies for influencing public discussions associated with technology-society issues, such as the greenhouse effect	
33.3%*	16.7%*	50%*	0%

*Because of rounding, percentages may not add up to 100%

d. practice forms of civic discussion and participation consistent with the ideals of citizens in a democratic republic

It is likely that, in meeting these two NCSS performance expectations, social studies teachers would include voting as an example of both a right and responsibility of citizenship (from standard a) and as a form of civic participation consistent with the ideals of citizens in a democratic process (from standard b). The additional steps that social studies teachers would need to take to address the concepts and skills of social mathematics, however, would be to engage students in substantive discussions and exercises that involve the mathematical and statistical nuances of such topics as the significance of close elections and the Electoral College. While it is not unreasonable to expect social studies teachers to discuss the ramifications of close elections and the Electoral College, *it is not likely* that social studies teachers (or the authors of these standards) would address the social mathematical aspects of these topics through the satisfaction of this particular standard. For that reason, NCSS performance standards b and d – as well as all other performance standards under the same heading – are classified as category 2 performance expectations.

The third commonality between Tables 4.1 through 4.6 is that each table contains a number of standards that are identified as category 3 performance expectations. Recall that this category represents those performance expectations identified as directly or indirectly addressing the concepts and skills of mathematics and are likely to be identified as doing so by the authors and consumers of the performance expectations in question. For the middle grade performance expectations, an average of approximately 31.1% of the performance expectations were classified as category 3 performance

Table 4.5

An Analysis of the Middle School Performance Expectations for Theme 10 of the NCSS Standards: Civic Ideals and Practices (p. 105)

Category 1	Category 2	Category 3	Category 4
a. examine the origins and continuing influence of key ideals of the democratic republican form of government, such as individual human dignity, liberty, justice, equality, and the rule of law	b. identify and interpret sources and examples of the rights and responsibilities of citizens	c. locate, access, analyze, organize, and apply information about selected public issues – recognizing and explaining multiple points of view	
b. identify and interpret sources and examples of the rights and responsibilities of citizens	d. practice forms of civic discussion and participation consistent with the ideals of citizens in a democratic republic	e. explain and analyze various forms of citizen action that influence public policy decisions	
i. explain the relationship between policy statements and action plans used to address issues of public concern	h. analyze the effectiveness of selected public policies and citizen behaviors in realizing the stated ideals of a democratic republican form of government	f. identify and explain the roles of formal and informal political actors in influencing and shaping public policy and decision-making	
	j. examine strategies designed to strengthen the "common good," which consider a range of options for citizen action	g. analyze the influence of diverse forms of public opinion on the development of public policy and decision-making	
40%*	20%*	40%*	0%

*Because of rounding, percentages may not add up to 100%

expectations, while an average of approximately 43.3% of the high school performance expectations were similarly categorized. Many of these identified performance expectations make use of the verbs *analyze*, *judge*, or *evaluate*, words that are suggestive of skills students of civics are to apply to information. The use of these words also suggests the possibility that the NCSS task force, ultimately responsible for the ideas and language included within all of the published performance expectations, recognizes the utility of social mathematical concepts and skills in analyzing and evaluating information.

The following three examples of NCSS performance expectations are classified as category 3 standards and reflect the use of the verbs *analyze*, *judge*, and *evaluate*. Let us examine how the use of the verbs *analyze*, *judge*, and *evaluate* often contribute to a performance expectation being classified as a category 3 performance expectation. Consider, for example, the following NCSS performance expectation included in table 4.1 (1994, p. 94):

> c. analyze and explain ideas and government mechanisms to meet needs and wants of citizens, regulate territory, manage conflict, and establish order and security.

It seems reasonable to expect that, through *analyzing* the government mechanisms that are in place to meet the needs and wants of citizens, a mathematical or statistical analysis of the effectiveness of the mechanism would take place. It is easy to

> conceive of a social studies teacher asking her students questions similar to the following: *How does government raise money to*

Table 4.6

An Analysis of the High School Performance Expectations for Theme 10 of the NCSS Standards: Civic Ideals and Practices (p. 139)

Category 1	Category 2	Category 3	Category 4
a. explain the origins and interpret the continuing influence of key ideals of the democratic republican form of government, such as individual human dignity, liberty, justice, equality, and the rule of law	b. identify, analyze, interpret, and evaluate sources and examples of citizens' rights and responsibilities	c. locate, assess, analyze, organize, synthesize, evaluate, and apply information about selected public issues – identifying, describing and evaluating multiple points of view	
i. construct a policy statement and an action plan to achieve one or more goals related to an issue of public concern	d. practice forms of civic discussion and participation consistent with the ideals of citizens in a democratic republic	e. analyze and evaluate the influence of various forms of citizen action on public policy	
	h. evaluate the degree to which public policies and citizen behaviors reflect or foster the stated ideals of a democratic republican form of government	f. analyze a variety of public policies and issues from the perspective of formal and informal political actors	
	j. participate in activities to strengthen the "common good," based upon careful evaluation of possible options for citizen action	g. evaluate the effectiveness of public opinion in influencing and shaping public policy development and decision-making	
20%*	40%*	40%*	0%

*Because of rounding, percentages may not add up to 100%

meet the needs and wants of citizens? How effective is government in meeting some or all of our wants and needs? How do we know (measure) this?

If students are to *analyze* government mechanisms, it seems reasonable to conclude that the NCSS task force expects that some amount of social mathematics will be used by students and teachers to apply to a given mechanism as a means of determining (analyzing) just how effective the mechanism is at meeting the needs and wants of society.

In some cases, *making a judgment* about something naturally leads to describing or comparing mathematical and statistical measures. Consider performance expectation letter b in Table 4.4 (1994, p. 132):

b. make judgments about how science and technology have transformed the physical world and human society and our understanding of time, space, place, and human-environment interactions.

Judgments likely to be made about how science and technology have transformed our physical world will include the notions that technology and scientific discoveries often make things better, cheaper, faster, more reliable, or more efficient. Yet these words are hallmarks of an uninformed judgment until concepts and skills of social mathematics are used to quantify and measure what is meant by better, cheaper, faster, more reliable, and more efficient. *How do you know that a new technology is more reliable than the technology that it replaced? How do you know that it is cheaper? How do you know that it is more efficient?* These are examples of the kinds of questions it seems reasonable to expect that teachers of the social studies would ask of their students in fulfilling this particular standard.

Evaluating a particular phenomenon can also include the application of concepts and skills of social mathematics. Consider NCSS performance expectation g in Table 4.6 (1994, p. 139):

> g. evaluate the effectiveness of public opinion in influencing and shaping public policy development and decision-making.

It certainly seems reasonable to conclude that any *evaluation of the effectiveness* of public opinion on shaping public policy development and decision-making would, by necessity, include a fairly comprehensive examination of how public opinion has shaped public policy. While it is possible for teachers and students to perform this evaluation using anecdotal evidence, it seems far more likely that teachers and students will use polling results and other similar measures of public opinion to help analyze the effectiveness of public opinion in influencing and shaping public policy. *Why are politicians influenced by public opinion polls? Do these polls really measure what they say they measure? How can a poll with a sample size of 1,500 accurately predict the opinion of a larger public?* Questions like these are likely to be raised by teachers and students in meeting this particular performance expectation.

Conclusions Drawn From the Analysis of the NCSS Standards

The conclusion most critical to this study is that none of the identified NCSS themes or the performance expectations aligned with those themes directly addresses the concepts and skills of social mathematics. Nowhere within the language of any of the 10 themes of the social studies, as identified by the NCSS, appear the words *social* *mathematics*, *mathematics*, *statistics*, *quantitative literacy*, or any derivations of these words. There is a number of social studies performance expectations aligned with the three themes identified in the preceding section that seem to indirectly address concepts and skills of social mathematics. Yet the effectiveness of these performance expectations in addressing the concepts and skills of social mathematics is certainly in question. While the previous section identified the ways in which it is *possible* to interpret some number of these performance expectations as addressing concepts and skills of social mathematics, it is difficult to determine if the NCSS task force, state boards of education, school district administrations, or social studies teachers will interpret any of the NCSS performance expectations classified as category 2 and category 3 performance expectations (see Tables 4.1 through 4.6) as actually addressing those concepts and skills.

This is not to suggest, however, that the NCSS task force failed to consider the role that social mathematics could play in civics education. Recall that the introduction to the *Curriculum Standards For Social Studies* includes a section entitled “Applying Knowledge, Skills, and Values to Civic Action.” Within this section is a description of the “…skills that should be promoted in an excellent social studies program…”, skills that include “…acquiring information and manipulating data” (1994, p. 7). The skills of acquiring information and manipulating data suggest a role for mathematics in citizenship education. Further, recall that the NCSS defines “social studies” as

> …the integrated study of the social sciences and humanities to promote civic competence...social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as

appropriate content from the humanities, mathematics, and natural sciences. (1994, p. vii)

It appears, therefore, that the National Council for the Social Studies recognizes that mathematics can and should play a role in both the larger, more encompassing conceptualization of the discipline of "the social studies," as well as within the more specific discipline of civics. This is an important conclusion, because it suggests that the NCSS envisions a role for social mathematics that extends beyond those individual disciplines of the social studies in which such study is to be expected – namely, economics and geography – and into the discipline of civics. This conclusion is also very much compatible with the theoretical arguments made by John Allen Paulos (1998), Lynn Steen (1990), and Michael Hartoonian (1989) regarding the notion that social mathematics has a place in civics education if we expect students to become informed and responsible American citizens.

One criticism of this apparent recognition, however, is that none of the themes of the social studies identified for consideration in this study makes clear and unambiguous references to social mathematics as it applies to civics. It seems reasonable to conclude that if the NCSS firmly supported instruction and practice in social mathematics within civics, this support would manifest itself in the inclusion of direct and unambiguous language in those themes and performance expectations aligned with civic instruction. Textbook publishers, state boards of education, school district administrators, civics teachers, and parents likely look to the themes and performance expectations published in *Curriculum Standards for Social Studies*, not to the *Executive Summary*, *Introduction*, or

Appendices to help them determine what should be included in state content standards and textbooks, as well as what should be taught in the civics classroom.

The Center For Civic Education and the *National Standards for Civics and Government*

Although the concepts and skills of social mathematics are not specifically addressed in any of the three themes or corresponding performance expectations identified as representative of civic instruction, what about the civic standards published by the Center for Civic Education? Recall that the NCSS recognizes that:

> …the social studies standards address overall curriculum design and comprehensive student performance expectations, while the individual discipline standards (civics and government, economics, geography, and history) provide focused and enhanced content detail. Teachers and curriculum designers are encouraged first to establish their program frameworks using the social studies standards as a guide, and then to use the standards from history, geography, civics, economics, and others to guide the development of grade level strands and courses. (1994, pp. vii-ix)

The NCSS identifies the Center for Civic Education as *the* body that publishes *the* national civic standards. To be sure, there exist other organizations that publish what they call "national civics standards" or "national standards for civic education," but the fact that the NCSS recognizes only the Center for Civic Education more than subtly suggests that it is the only organization that enjoys the support of the NCSS (1996).

National Standards for Civics and Government was published by the Center for Civic Education in 1994. The Center for Civic Education received financial support

Table 4.7

A Combined Look at the National Standards for Civics and Government, Grades 5-12
(pp. 43-44 and 87-88)

Standard I: What are Civic Life, Politics, and Government?

A. (Grades 5-12) What is civic life? What is politics? What is government? Why are government and politics necessary? What purposes should government serve?

B. (Grades 5-12) What are the essential characteristics of limited and unlimited government?

C. C. (Grades 5-12) What are the nature and purposes of constitutions?

D. (Grades 5-12)What are alternative ways of organizing constitutional governments?

Standard II: What are the Foundations of the American Political System?

A. (Grades 5-12) What is the American idea of constitutional government?

B. (Grades 5-12) What are the distinctive characteristics of American society?

C. (Grades 5-12) What is American political culture?

D. (Grades 5-12) What values and principles are basic to American constitutional democracy?

Standard III: How Does the Government Established by the Constitution Embody the Purposes, Values, and Principles of American Democracy?

A. (Grades 5-12) How are power and responsibility distributed, shared, and limited in the government established by the United States Constitution?

B. (Grades 5-8) What does the national government do? (Grades 9-12) How is the national government organized and what does it do?

C. (Grades 5-12) How are state and local governments organized and what does it do?

D. (Grades 5-8) Who represents you in local, state, and national governments? (Grades 9-12) What is the place of law in the American constitutional system?

Table 4.7, (cont.)

A Combined Look at the National Standards for Civics and Government, Grades 5-12

E. (Grades 5-8) What is the place of law in the American constitutional system? (Grades 9-12) How does the American political system provide for choice and opportunities for participation?

F. (Grades 5-8) How does the American political system provide for choice and opportunities for participation?

Standard IV: What is the Relationship of the United States to Other Nations and to World Affairs?

A. (Grades 5-12) How is the world organized politically?

B. (Grades 5-8) How has the United States influenced other nations, and how have other nations influenced American politics and society? (Grades 9-12) How would domestic politics and constitutional principles of the United States affect its relations with the world?

C. (Grades 9-12) How has the United States influenced other nations, and how have other nations influenced American politics and society?

Standard V: What are the Roles of the Citizens in American Democracy?

A. (Grades 5-12) What is citizenship?

B. (Grades 5-12) What are the rights of citizens?

C. (Grades 5-12) What are the responsibilities of citizens?

D. (Grades 5-8) What dispositions or traits of character are important to the preservation and improvement of American constitutional democracy? (Grades 9-12) What civic dispositions or traits of private and public character are important to the preservation and improvement of American constitutional democracy?

E. (Grades 5-12) How can citizens take part in civic life?

from the United States Department of Education and the Pew Charitable Trusts. These standards, published for grades K through 12, were a response to the previously mentioned Educate America Act of 1992. Two groups of civic standards are considered in this section: the content standards for grades 5 through 8 and the content standards for grades nine through twelve. This is in keeping with results of the literature review conducted in chapter two – that it is within the middle grades and high school in which it is most likely that instruction in the concepts and skills of social mathematics takes place.

The content standards for fifth through eighth grades and the ninth through twelfth grades contain the same 5 major categories. The five categories is posed as question (pp. 33-34):

1. What are Civic Life, Politics, and Government?
2. What are the Foundations of the American Political System?
3. How Does the Government Established by the Constitution Embody the Purposes, Values, and Principles of American Democracy?
4. What is the Relationship of the United States to Other Nations and to World Affairs?
5. What are the Roles of a Citizen in an American Democracy?

These 5 major categories are followed by a number of subcategories, also posed as questions. The 5 major categories and their accompanying subcategories appear in their entirety as Table 4.7. Because of the similarities in subcategories between grades 5 through 8 and grades 9 through 12, appropriate notations are made only in those subcategories that differ between these two sets of grade levels. Tables 4.8 and 4.9, adapted from *National Standards for Civics and Government* (pp. 141-5), serve to identify the concepts and skills to be addressed through fulfillment of the civics and government standards.

Similar to the analysis conducted of the ten content themes published by the National Council for the Social Studies, *National Standards for Civics and Government* published by The Center for Civic Education was thoroughly analyzed on three separate occasions. The intent of these readings was the same as for the readings of the NCSS content themes: to identify and classify every published standard related to civics. The standards were organized into the same four categories used in the analysis of the performance expectations aligned with the content themes published by the National Council for the Social Studies. Recall that the first of these categories, Category 1, includes those standards that do not directly nor indirectly address the concepts and skills of social mathematics. Category 2 reflects those standards that, while possibly addressing concepts and skills of social mathematics in an indirect manner, are not likely to be interpreted as doing so by the authors and consumers of the standards in question. Category 3 includes those

Table 4.8

National Standards for Civics and Government: Organizing Questions and Content Summary, Grades 5 through 8 (pp. 141-145)

5 – 8	5 - 8	5 - 8
I. What Are Civic Life, Politics, and Government?	**II. What Are the Foundations of the American Political System?**	**III. How Does the Government Established by the Constitution Embody the Purposes, Values, and Principles of American Democracy?**
I.A.1 Defining civic life, politics, and government I.A.2 Necessity and purposes of government I.B.1 Limited and unlimited governments I.B.2 The rule of law I.C.1 Concepts of "constitution" I.C.2Purposes and uses of constitutions I.C.3 Conditions under which constitutional government flourishes I.D.1 Shared powers and parliamentary systems I.D.2 Confederal, federal, and unitary systems	II.A.1 The American idea of constitutional government II.B.1Distinctive characteristics of American society II.B.2 The role of volunteerism in American life II.B.3 Diversity in American Society II.C.1 American identity II.C.2 The character of American political conflict II.D.1 Fundamental values and principles II.D.2 Conflicts among values and principles in American political and social life II.D.3 Disparities between ideals and reality in American political and social life	III.A.1 Distributing, sharing, and limiting powers of the national government III.A.2 Sharing of powers between the national and state governments III.B.1 Major responsibilities for domestic and foreign policy III.B.2 Financing government through taxation III.C.1 State governments III.C.2 Organization and responsibilities of state and local governments III.D.1 Who represents you in legislative and executive branches of your local, state, and national governments III.E.1 The place of law in American society III.E.2 Criteria for evaluating rules and laws III.E.3 Judicial protection of the rights of individuals III.F.1 The public agenda III.F.2 Political communication III.F.3 Political parties, campaigns, and elections III.F.4Associations and groups III.F.5 Forming and carrying out public policy

Table 4.8 (cont.)

National Standards for Civics and Government: Organizing Questions and Content Summary, Grades 5 through 8

5 - 8	5 - 8
IV. What is the Relationship of the United States to Other Nations and to World Affairs?	**V. What Are the Roles of the Citizen in American Democracy?**
IV.A.1 Nation-states IV.A.2 Interaction among nation-states IV.A.3United States' relations with other nation-states IV.A.4 International organizations IV.B.1 Impact of the American concept of democracy and individual rights on the world IV.B.2 Political, demographic, and environmental developments	V.A.1 The meaning of citizenship V.A.2 Becoming a citizen V.B.1 Personal rights V.B.2 Political rights V.B.3 Economic rights V.B.4 Scope and limits of rights V.C.1 Personal responsibilities V.C.2 Civic responsibilities V.D.1 Dispositions that enhance citizen effectiveness and promote the healthy functioning of American constitutional democracy V.E.1 Participation in civic and political life and the attainment of individual and public goals V.E.2 The difference between political and social participation V.E.3 Forms of political participation V.E.4 Political leadership and careers in public service V.E.5 Knowledge and participation

standards that are likely to be interpreted by the authors and consumers of the standards in question as addressing concepts and skills of social mathematics. Category 4 includes those standards that directly address the concepts and skills of social mathematics through clear and unambiguous language. These findings are presented in Table 4.10 (grades 5 through 8) and in Table 4.11 (grades 9 through 12).

The national standards for civics and government as identified and published by the Center for Civic Education are similar to the social studies themes published by the NCSS in that none of the standards directly address the concepts and skills of social mathematics as they apply to civics. Nowhere within the *National Standards for Civics and Government* appear the words *social mathematics, mathematics, statistics, quantitative literacy*, or any derivations of these words. Much like those themes published by the NCSS and identified in the previous section, however, there are civics and government standards classified as category 3 standards (see Tables 4.10 and 4.11). A review of a sample of those standards is prudent here, as such a review can serve to illustrate the process of identification and categorization.

Determining if a standard in question is a category 1 or category 4 standard is a relatively simple procedure. In order for a standard to be classified as a category 4 standard, it must contain clear and unambiguous language that reflects a direct commitment to the concepts and skills of social mathematics. In order to determine if a standard in question is a category 1 standard, it must be reasonably clear that it would be very difficult, if not impossible, to interpret the standard as addressing the concepts and skills of social mathematics. Category 2 standards and category 3 standards are more difficult to determine. Both hinge on the likelihood that the standard in question is either

Table 4.9

National Standards for Civics and Government: Organizing Questions and Content Summary, Grades 9 through 12 (pp. 141-145)

9 - 12	9 - 12	9 - 12
I. What Are Civic Life, Politics, and Government?	**II. What Are the Foundations of the American Political System?**	**III. How Does the Government Established by the Constitution Embody the Purposes, Values, and Principles of American Democracy?**
I.A.1 Defining civic life, politics, and government I.A.2 Necessity of politics and government I.A.3 The purposes of politics and government I.B.1 Limited and unlimited governments I.B.2 The rule of law I.B.3 Civil society and government I.B.4 The relationship of limited government to political and economic freedom I.C.1 Concepts of "constitution" I.C.2 Purposes and uses of constitutions I.C.3 Constitutions under which constitutional government flourishes I.D.1 Shared powers and parliamentary systems I.D.2 Confederal, federal, and unitary systems I.D.3 Nature of representation	II.A.1 The American idea of constitutional government II.A.2 How American constitutional government has shaped the character of American society II.B.1 Distinctive characteristics of American society II.B. 2 The role of volunteerism in American life II.B.3 The role of organized groups in political life II.B.4 Diversity in American society II.C.1 American national identity and political culture II.C.2 Character of American political conflict II.D.1 Liberalism and American constitutional democracy II.D.2 Republicanism and American constitutional democracy II.D.3 Fundamental values and principles II.D.4 Conflicts among values and principles in American political and social life II.D.5 Disparities between ideals and reality in American political and social life	III.A.1 Distributing governmental power and preventing its abuse III.A.2 The American federal system III.B.1 The institutions of the national government III.B.2 Major responsibilities of the national government in domestic and foreign policy III.B.3 Financing government through taxation III.C.1 The constitutional status of state and local governmentsIII.C.2 Organization of state and local governments III.C.3 Major responsibilities of state and local governments III.D.1 The place of law in American societyIII.D.2 Judicial protection of the rights of individuals III.E.1 The public agenda III.E.2 Public opinion and behavior of the electorate III.E.3 Political communication: television, radio, the press, and political persuasion III.E.4 Political parties, campaigns, and elections III.E.5 Associations and groups III.E.6 Forming and carrying out public policy

Table 4.9, (cont.)

National Standards for Civics and Government: Organizing Questions and Content Summary, Grades 9 through 12

9 - 12	9 - 12
IV. What is the Relationship of the United States to Other Nations and to World Affairs?	**V. What Are the Roles of the Citizen in American Democracy?**
IV.A.1 Nation-states IV.A.2 Interaction among nation-states IV.A.3 International organizations IV.B.1 The historical context of United States foreign policy IV.B.2 Making and implementing United States foreign policy IV.B.3 The ends and means of United States foreign policy IV.C.1 Impact of the American concept of democracy and individual rights on the world IV.C.2 Political developments IV.C.3 Economic, technological, and cultural developments IV.C.4 Demographic and environmental developments IV.C.5 United States and international organizations	V.A.1 The meaning of citizenship in the United States V.A.2 Becoming a citizen V.B.1 Personal rights V.B.2 Political rights V.B.3 Economic rights V.B.4 Relationships among personal, political, and economic rights V.B.5 Scope and limits of rights V.C.1 Personal responsibilities V.C.2 Civic responsibilities V.D.1 Dispositions that lead the citizen to be an independent member of society V.D.2 Dispositions that foster respect for individual worth and human dignity V.D.3 Dispositions that incline the citizen to public affairs V.D.4 Dispositions that facilitate thoughtful and effective participation in public affairs V.E.1 The relationship between politics and the attainment of individual and public goals V.E.2 The difference between political and social participation V.E.3Forms of political participation V.E.4 Political leadership and careers in public service V.E.5 Knowledge and participation

intended to be interpreted as addressing the concepts and skills of social mathematics by the author(s) who wrote the standard, or is likely to be interpreted as addressing the concepts and skills of social mathematics by those who are charged with addressing the standards – namely, classroom teachers.

The following national standards for civics and government serve as examples of category 1 standards (1994, pp. 45, 55, 65, 89, 102, and 116):

1.A.1 (grades 5 through 12) Defining civic life, politics, and government

II.B.2 (grades 5 through 12) The role of volunteerism in American life

III.D.1 (grades 5 through 8) Who represents you in legislative and executive branches of your local, state, and national governments?

It is difficult to discern how the authors or consumers of any of these three standards would interpret them as addressing concepts and skills of social mathematics. As was stated in the previous analysis of the NCSS performance expectations, this is not to suggest that it would be *impossible* to interpret any of the three standards above as indeed addressing the concepts and skills of social mathematics. Theoretically, one could use standard III.D.1 to help students develop a statistical "picture" of what Congress looks like. Students could research the ages, political party affiliations, race, religion, gender – the list goes on – of Congressional representatives and represent this information statistically as a way to develop conclusions regarding how well Congress truly represents the American people. Although this is arguably a good way to provide students practice with the concepts and skills of social mathematics, it is unlikely that the authors and consumers of these three standards (and the rest of the standards classified as

Table 4.10

An Analysis of the National Standards For Civics And Government (Grades 5 though 8)

Category 1	Category 2	Category 3	Category 4
1.A.1 Defining civic life, politics, and government	II.B.1 Distinctive characteristics of American society	III.F.2 Political communication	
1.A.2 Necessity and purposes of government	II.C.2 Character of American political conflict	IV.B.2 Making and implementing United States foreign policy	
1.B.1 Limited and unlimited governments	III.B.2 Financing government through taxation	V.B.3 Economic rights	
1.B.2 The rule of law	III.F.1 The public agenda	V.E.3 Forms of political participation	
1.C.1 Concepts of "constitution"	III.F.3 Political parties, campaigns, and elections		
I.C.2Purposes and uses of constitutions	III.F.4Associations and groups		
I.C.3 Conditions under which constitutional government flourishes	III.F.5 Forming and carrying out public policy		
I.D.1 Shared powers and parliamentary systems	V.C.1 Personal responsibilities		
I.D.2 Confederal, federal, and unitary systems	V.C.2 Civic responsibilities		
II.A.1 The American idea of constitutional government	V.D.1 Dispositions that enhance citizen effectiveness and promote the healthy functioning of American constitutional democracy		
II.B.2 The role of volunteerism in American life	V.E.1 Participation in civic and political life and the attainment of individual and public goals		
II.B.3 Diversity in American Society	V.E.2 The difference between political and social participation		
II.C.1 American identity	V.E.5 Knowledge and participation		
II.D.1 Fundamental values and principles			

Table 4.10, (cont.)

An Analysis of the National Standards For Civics And Government (Grades 5 though 8)

Category 1	Category 2	Category 3	Category 4
II.D.2 Conflicts among values and principles in American political and social life			
II.D.3 Disparities between ideals and reality in American political and social life			
III.A.1 Distributing governmental power and preventing its abuse			
III.A.2 The American federal system			
III.B.1 The institutions of the national government			
III.C.1 State governments			
III.C.2 Organization and responsibilities of state and local governments			
III.D.1 Who represents you in legislative and executive branches of your local, state, and national governments			
III.E.1 The place of law in American society			
III.E.2 Criteria for evaluating rules and laws			
III.E.3 Judicial protection of the rights of individuals			
IV.A.1 Nation-states			
IV.A.2 Interaction among nation-states			
IV.A.3United States' relations with other nation-states			
IV.A.4 International organizations			
IV.B.1 Impact of the American concept of democracy and individual rights on the world			
V.A.1 The meaning of citizenship			
V.A.2 Becoming a citizen			
V.B.1 Personal rights			
V.B.2 Political rights			
V.B.4 Scope and limits of rights			
V.E.4 Political leadership and careers in public service			
67.9%*	**24.5%***	**5.7%***	**0%***

*Because of rounding, percentages may not add up to 100%

category 1 standards) would interpret this particular standard in this manner because the standard seems to require students only to name their representatives, not to develop a statistical picture of national representation for the United States as a whole.

Determining category 2 or category 3 standards is not as difficult as discerning the differences among them. Recall that category 2 standards reflect those standards that, while possibly addressing concepts and skills of social mathematics in an indirect manner, are not likely to be interpreted as doing so by the authors and consumers of the standards in question. Category 3 includes those standards that are likely to be interpreted by the authors and consumers of the standards in question as addressing concepts and skills of social mathematics. Notice that in both cases, the concepts and skills of social mathematics are likely to be present within the identified standard. The difference between a category 2 standard and a category 3 standard lies in the likelihood of the authors or consumers of the standard interpreting the standard in question as addressing concepts and skills of social mathematics. In the former category, the likelihood remains quite small; in the latter, the chances that the authors and consumers of the standard interpret it as addressing the concepts and skills of social mathematics are greater.

A few examples are helpful to illustrate this distinction. Consider two standards listed in Table 4.10 that use very similar language, but are classified under two different categories (category 2 and category 3). These two standards, V.E.2 and V.E.3, appear below (1994, pp. 81-2):

V.E.2 (Identified as a category 2 standard): The difference between political and social participation. Students should be able to explain the difference between political and social participation.

V.E.3 (Identified as a category 3 standard): Forms of political participation. Students should be able to describe the means by which Americans can monitor and influence politics and government.

Both standards refer to political participation, yet both address different concepts and skills. In the case of standard V.E.2, students are to "…explain the importance of both political and social participation to American constitutional democracy" (CCE, 1994, p. 81) and to "…identify opportunities in their own community for both political and social participation" (CCE, 1994, p. 81). Standard V.E.2 is classified as a category 2 standard because, to fulfill both of these performance objectives, it is *possible* that social studies teachers and their students would discuss the roles of voting and donating time and money to political parties or candidates. It is not inconceivable that some discussion might also take place regarding the *effectiveness* of these two forms of political (and sometimes social) participation. One way to measure the effectiveness of voting or donating time or money to a candidate's party, for example, is to compare the rates of voter turnout in an election with the amount of money raised by a candidate and compare these numeric figures to the results of the election. This is a basic form of statistical comparison. In this scenario, however, several assumptions are made that may or may not be warranted, and therefore this particular standard is classified as a category 2 standard. How would the language used in standard V.E.2 need to change to alter the classification of the standard? If standard V.E.2 asked students to compare and analyze various forms of political participation and to draw conclusions regarding the effectiveness of the various forms of participation, for example, standard V.E.2 would then be classified as a category 3 standard.

Standard V.E.3 (grades 5-8) employs similar language as standard V.E.2. Standard V.E.3, *forms of political participation*, is classified as a category 3 standard for several reasons. Standard V.E.3 states that students should be able to explain how Americans can use voting, learning about public issues, discussing public issues, joining political parties and interest groups, and contributing money to political campaigns as ways to monitor and influence politics and government at local, state, and national levels. While many of these actions themselves are potential exercises in the concepts and skills of social mathematics, an important and critical question that seems likely to be asked in a social studies classroom addressing this standard is, how does one know that any of these actions actually *influence* politics and government? How do we determine (measure) influence? Because it seems likely that students and teachers who address standard V.E.3 will deal with the concepts and skills of social mathematics, this particular standard is classified as a category 3 standard.

Consider two additional examples of category 2 standards and two additional examples of category 3 standards. In both cases, I provide a rationale for why a particular standard is classified as a category 2 or category 3 standard. One example of a category 2 standard will come from Table 4.10 (standards for grades 5 through 8) while the other example of a category 2 standard will come from Table 4.11 (standards for grades 9 through 12). The same is done for the two examples of category 3 standards.

Table 4.11

An Analysis of the National Standards For Civics And Government (Grades 9 though 12)

Category 1	Category 2	Category 3	Category 4
I.A.1 Defining civic life, politics, and government	II.B.1 Distinctive characteristics of American society	I.D.3 Nature of representation	
I.A.2 Necessity of politics and government	II.B.4 Diversity in American society	III.E.1 The public agenda	
I.A.3 The purposes of politics and government	II.C.2 Character of American political conflict	III.E.2 Public opinion and behavior of the electorate	
I.B.1 Limited and unlimited governments	III.B.1 The institutions of the national government	III.E.3 Political communication: television, radio, the press, and political persuasion	
I.B.2 The rule of law	III.B.3 Financing government through taxation	III.E.4 Political parties, campaigns, and elections	
I.B.3 Civil society and government	III.C.3 Major responsibilities of state and local governments	IV.C.4 Demographic and environmental developments	
I.B.4 The relationship of limited government to political and economic freedom	III.E.5 Associations and groups	V.B.3 Economic rights	
I.C.1 Concepts of "constitution"	III.E.6 Forming and carrying out public policy	V.E.3Forms of political participation	
I.C.2 Purposes and uses of constitutions	IV.C.3 Economic, technological, and cultural developments		
I.C.3 Constitutions under which constitutional government flourishes	V.B.4 Relationships among personal, political, and economic rights		
I.D.1 Shared powers and parliamentary systems	V.C.1 Personal responsibilities		
I.D.2 Confederal, federal, and unitary systems	V.C.2 Civic responsibilities		
II.A.1 The American idea of constitutional government	V.E.1 The relationship between politics and the attainment of individual and public goals		

Table 4.11, (cont.)

An Analysis of the National Standards For Civics And Government (Grades 9 though 12)

Category 1	Category 2	Category 3	Category 4
II.A.2 How American constitutional government has shaped the character of American society	V.E.2 The difference between political and social participation		
II.B. 2 The role of volunteerism in American life	V.E.5 Knowledge and participation		
II.B.3 The role of organized groups in political life			
II.C.1 American national identity and political culture			
II.D.1 Liberalism and American constitutional democracy			
II.D.2 Republicanism and American constitutional democracy			
II.D.3 Fundamental values and principles			
III.C.2 Organization of state and local governments			
III.D.1 The place of law in American society			
III.D.2 Judicial protection of the rights of individuals			
IV.A.1 Nation-states			
IV.A.2 Interaction among nation-states			
IV.A.3 International organizations			
IV.B.1 The historical context of United States foreign policy			
IV.B.2 Making and implementing United States foreign policy			
IV.B.3 The ends and means of United States foreign policy			
IV.C.1 Impact of the American concept of democracy and individual rights on the world			
IV.C.2 Political developments			
IV.C.5 United States and international organizations			
V.A.1 The meaning of citizenship in the United States			
V.A.2 Becoming a citizen			
V.B.1 Personal rights			
V.B.2 Political rights			
V.B.5 Scope and limits of rights			
V.D.1 Dispositions that lead the citizen to be an independent member of society			
V.D.2 Dispositions that foster respect for individual worth and human dignity			
V.D.3 Dispositions that incline the citizen to public affairs			
V.D.4 Dispositions that facilitate thoughtful and effective participation in public affairs			
V.E.4 Political leadership and careers in public service			
67.6%*	**21.1%***	**11.3%***	**0%***

*Because of rounding, percentages may not add up to 100%

The four standards are offered to serve as additional evidence as to the rationale behind why and how decisions were made regarding the classification of all the standards published by the Center for Civic Education that were ultimately classified as category 2 and category 3 standards. Standards III.B.3 (grades 9 through 12) and V.E.1 (grades 5 through 8) will serve as examples of two standards published by the Center for Civic Education classified in this study as category 2 standards. Standards I.D.3 (grades 9 through 12) and III.F.2 (grades 5 through 8) will serve as examples of two standards published by the Center for Civic Education classified in this study as category 3 standards.

Standard III.B.3 (grades 9 through 12), *financing the government through taxation*, contains less instruction in and practice with the concepts and skills of social mathematics than the title may suggest. Standard III.B.3 states "…students should be able to evaluate, take, and defend positions on issues regarding how government should raise money and pay for its operations and services" (CCE, 1994, p. 113). The sub-standards listed under III.B.3 ask students to identify major sources of tax revenue, to explain the provisions of the United States Constitution that allow for the levying of taxes, to explain the history of taxation in the United States, and to "…explain why there is often a tension between citizens' desire for government services and benefits and their unwillingness to pay taxes for them" (p. 113). While standard III.B.3 makes no mention of the concepts and skills of social mathematics, it seems plausible that teachers and students of civics may address social mathematical principles through satisfaction of this particular standard. Some comparisons may be drawn, for example, between federal income (taxes) and expenditures to evaluate how federal dollars are spent. Some analysis may take place concerning how taxation rates have changed over the decades and why these changes have taken place. Yet while these scenarios seem plausible, the language used within the standard does not directly support such comparisons or analyses to the extent that standard III.B.3 could be classified as a category 3 standard.

Consider the second example of a category 2 standard, V.E.1 (grades 5 through 8). Standard V.E.1, *participation in civic and political life and the attainment of individual and public goals*, lists two related sub-standards. The first asks students to identify examples of their personal goals and to explain how their participation in civic and political life will help them to attain their goals. The second asks students to identify examples of public goals and to explain how their participation in civic and political life will help to attain these goals. In both examples, it is clear that students need to articulate how their participation (and ostensibly the participation of others) will affect their personal goals and those of society. This relationship between action and result can often be mathematical in nature, and that is why standard V.E.1 is classified as a category 2 standard. *If a student wants to live in a safe neighborhood or obtain a good education (examples cited by the Center for Civic Education), how does civic and political participation help to realize these goals?*

It seems plausible that, as part of the fulfillment of this standard, students and teachers would analyze past examples of civic and political actions that have helped to realize an individual or societal goal. This analysis is likely to encompass mathematical and statistical comparisons, examining such things a voter registration and turnout, the effectiveness of contributions to non profit organizations, the number of volunteers dedicated to solving a particular social problem – as well as the impact of social and economic conditions on the ability to achieve personal and societal goals (literacy rates, crime rates, poverty rates, tax bases, rates of incarceration, juvenile delinquency, etc.). While the aforementioned scenarios are perhaps plausible, they do not seem likely enough to classify this particular standard as a category 3 standard.

What types of words and language help to identify and classify a particular standard as a category 3 standard? Consider, for example, content standard I.D.3 (grades 9-12), which states that "Students should be able to evaluate, take, and defend positions on how well alternative forms of representation serve the purposes of constitutional government" (CCE, 1994, p. 98). Some of the benchmarks of achieving this standard as identified by the Center for Civic Education include evaluating differing bases of electoral systems like winner-take-all and proportional systems, and evaluating differing theories of representation such as representation based on a particular constituency or a society as a whole (CCE, 1994). Both of these aforementioned benchmarks of achievement seem to indirectly address the concepts and skills of social mathematics. It is unlikely that a full evaluation of either different electoral systems or different theories of representation would ignore the mathematical and statistical realities and implications of population, representation, and voting habits of the general public and of specific populations (to name but a few examples) or ignore the need to compare statistical representations of this data to bring about a more comprehensive evaluation of the electoral systems or theories of representation in question.

Consider a second example of a standard classified as a category 3 standard. Standard III.F.2, *political communication*, states that "Students should be able to evaluate, take, and defend positions on the influence of the media on American political life" (CCE, 1994, p. 69). Consider the following three benchmarks for achieving this standard as identified by the Center for Civic Education (p. 69):

- Evaluate the influence of television, radio, the press, newsletters, and emerging means of electronic communication in American politics
- Explain how citizens can evaluate information and arguments received from various sources so that they can make reasonable choices on public issues and among candidates for political office
- Evaluate the opportunities the media provide for individuals to communicate their concerns and positions on current issues, e.g., letters to the editor, talk shows, "op-ed pages", public opinion polls

The first and third benchmarks for achievement reproduced above ask students to *evaluate* the influence of the media in the case of the first benchmark, and to *evaluate* opportunities that the media provide in the third benchmark. Both strongly suggest that some type of measurement needs to take place as part of the overall evaluation. In the first benchmark, it seems reasonable to conclude that students would spend some time examining *how* these various identified forms of media (and possibly others not identified and included within this benchmark) influence American politics. *Are some, for example, more effective in communicating a message, swaying public opinion, or garnering votes for a politician more than others?* How would students measure and compare the measurements of the effectiveness that these various media have on American politics? A similar conclusion can be drawn from the evaluation students are to do in the third benchmark for achieving standard III.F.2. It seems reasonable to conclude that if students are to evaluate the opportunities the media provide for individuals to communicate their concerns and positions on current issues, some instruction in and practice with the concepts and skills of social mathematics would need to take place. It is conceivable that teachers of civics would ask their students questions such as: *Is one form of media more effective when it comes to allowing individuals to communicate their concerns and positions on current issues than another form? How do we know (measure) this?*

These and other standards identified as category 3 standards are significant because they all contain language that is important to consider given the nature of this study. While it is true that no standard published by either the National Council for the Social Studies or the Center for Civic Education contains direct and unambiguous language in support of the inclusion of *social mathematics*, *mathematics*, *statistics*, *quantitative literacy*, or any derivations of these words, other standards include language that is suggestive of support for social mathematics. Standards that ask students of the social studies in general and of civics in particular to evaluate, analyze, and compare information, results, or phenomenon often require some amount of social mathematics to achieve a reasonable level of evaluation, analysis, and comparison.

Conclusions Drawn From the CCE Standards

Similar to the results pertaining to the national standards for the social studies Published by the NCSS, no standard published by the Center for Civic Education directly addresses the concepts and skills of social mathematics. Nowhere within the language of any of the national civics and government standards, as identified by the CCE, appear the words *social mathematics*, *mathematics*, *statistics*, *quantitative literacy*, or any derivations of these words. There is a number of civics and government standards that seem to indirectly address concepts and skills of social mathematics. Yet the effectiveness of these standards in addressing the concepts and skills of social mathematics is certainly in question. While the previous section identified the ways in which it is *possible* to interpret some number of these standards as addressing concepts and skills of social mathematics, it is difficult to determine if the authors of *National Standards for Civics and Government*, state boards of education, school district administrations, or social studies teachers will interpret any of the CCE standards classified as category 2 and category 3 standards (see Tables 4.10 and 4.11) as actually addressing those concepts and skills.

Similar to *Curriculum Standards for Social Studies*, the Center for Civic Education includes within *National Standards for Civics and Government* several pages devoted to enumerating the skills of social studies. The Center for Civic Education labels these as "intellectual skills", and identifies them as the ability of students to (pp. 4-5):

1. Identify
2. Describe
3. Explain
4. Evaluate a position
5. Take a position
6. Defend a position

None of these six "intellectual skills" identified by the Center for Civic Education includes any direct or indirect references to ways in which an understanding of certain mathematics and statistical concepts and skills is crucial to an informed citizenry. The descriptions of the skills are decidedly non-quantitative in form and substance.

Conclusions

Because no theme, standard, or performance expectation published by the National Council for the Social Studies or the Center for Civic Education directly addresses the concepts and skills of social mathematics, it would not prove instructive to apply the social mathematics rubric in Table 3.3 to any of the identified themes, standards, or performance expectations. The social mathematics rubric should only be applied to those themes, standards, and performance expectations identified as category 4 standards, standards that definitively address the concepts and skills of social mathematics. This is problematic because it is impossible to determine which, how many, or even if any of the themes, standards, and performance expectations identified as category 2 or category 3 standards would actually be interpreted as addressing the concepts and skills of social mathematics by the authors and consumers of those standards, themes, and performance expectations. There exists, in other words, issues as basic as *if* the national standards even reflect tenets of social mathematics. In light of this, it seems premature to attempt to analyze the level of quality of those standards, themes, and performance expectations that *may* be interpreted as addressing the concepts and skills of social mathematics.

Though it may be less than useful to apply the social mathematics rubric to those national standards, themes, and performance expectations identified as category 2 and category 3 standards in this chapter, there are still several important conclusions to be drawn from Tables 4.1 through 4.6 (reflecting the NCSS content standards) and from Tables 4.10 and 4.11 (reflecting the Center for Civic Education content standards). These conclusions, presented over the following pages, support three conjectures. I will revisit these three conjectures in the concluding sections of chapters 5 and 6 to determine if the analyses of state content standards and *Magruder's American Government* may help to provide additional evidence to support or refute one or more of the conjectures.

One conclusion drawn from the analyses of Tables 4.1 through 4.6 and Tables 4.10 and 4.11 is that, because no theme, standard, or performance expectation directly addresses the concepts and skills of social mathematics, neither the National Council for the Social Studies nor the Center for Civic Education believes that social mathematics should play a role in the civic education of our nation's youth. Nowhere among any of the themes, standards, or performance expectations published by either of the national organizations are the words *social mathematics*, *mathematics*, *statistics*, *quantitative literacy*, or any derivations of these words to be found. This conclusion leads to the first, and least substantiated, of the three conjectures: the authors and editors of the national standards published by the NCSS and the Center for Civic Education do not feel that instruction in and practice with the concepts and skills of social mathematics represents an important component of a civics education.

While it is accurate to assert that neither the NCSS nor the Center for Civic Education directly addresses the concepts and skills of social mathematics anywhere within their published standards, there exists evidence to suggest that both organizations indirectly support instruction in and practice with these concepts and skills. This indirect support comes in the form of content standards published by both organizations that require students to *analyz*e, *evaluate*, and *compare* social phenomenon – activities that are impossible to do effectively unless the information to be analyzed, evaluated, and compared can be accurately quantified (measured) in some way. Further, recall that the very definition of the "social studies" authored by the NCSS embraces the discipline of mathematics as a component feature of what the organization identifies as the primary purpose of studying the social studies: "…to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world" (NCSS, 1994, p. 3).

The second conclusion drawn from the analyses of Tables 4.1 through 4.6 and Tables 4.10 and 4.11 concerns the choice of language used by the authors and editors of both the national standards published by the National Council for the Social Studies and the Center for Civic Education. Many of the themes, performance expectations, and standards identified as category 2 and category 3 standards make use of the verbs *evaluate*, *analyze*, and *compare* to describe an action that students are to take when addressing content. The use of the words *evaluate*, *analyze*, and *compare* within themes, standards, and performance expectations suggests that if the National Council for the Social Studies and the Center for Civic Education see a role for social mathematics in civics, *that role may be one of a skill of citizenship*. The content standards published by both organizations outline what students are to do either in the process, or as the result, of fulfilling a given standard. There is very little, if any, identification of *precise skills* students are to learn or use within the themes, content standards, or performance expectations. While the words *evaluate*, *analyze*, and *compare* appear in many of the content standards, little discussion takes place concerning *how* students are to evaluate, analyze, and draw these comparisons. If the National Council for the Social Studies and the Center for Civic Education conceptualize social mathematics as a skill of civics, *this may explain why little or no mention of the concepts and skills of social mathematics is* *made in the standards themselves*. This finding is significant because it may explain how the national organizations of the National Council for the Social Studies and the Center for Civic Education can be supportive of teaching the concepts and skills of social mathematics, but not directly address those concepts and skills within the themes, standards, and performance expectations published by their organizations.

This conclusion supports a second conjecture: that the National Council for the Social Studies and the Center for Civic Education support social mathematics as a skill of civics, and as such it is not adequately represented in *content* standards. Are there other areas within the National Council of the Social Studies' *Curriculum Standards for the Social Studies* and the Center for Civic Education's *National Standards for Civics and Government* in which explanations and examples are given concerning the skills of social studies and civics as they relate to social mathematics? Recall that *Curriculum Standards for the Social Studies* includes a section entitled "Applying Knowledge, Skills, and Values to Civic Action". Within this section is a description of the "…skills that should be promoted in an excellent social studies program…" skills that include "…acquiring information and manipulating data" (1994, p. 7). *National Standards for Civics and Government* includes a similar section that describes the skills that students of civics should be taught and encouraged to develop as a result of civic instruction. It is within this section that the editors of the *National Standards for Civics and Government* explain how students are to identify, describe, explain, evaluate a position, take a position, and defend a position. None of these explanations, however, includes language that identifies any skill associated with social mathematics, nor do any of the explanations include indirect references to the skills of social mathematics similar to the language used by the NCSS task force.

A third conclusion drawn from the analyses of Tables 4.1 through 4.6 and Tables 4.10 and 4.11 lends support for a third conjecture: that both the NCSS and the Center for Civic Education recognize that social mathematics is an important skill of civics, but feel that the responsibility of teaching those skills belongs to another discipline. There is some circumstantial support for this conclusion. First, both organizations must expect that some level of instruction in and practice with the concepts and skills of social mathematics would need to take place if all of the themes and standards that ask students to evaluate, analyze, and compare are to be met with a reasonable degree of quality. Yet given this, neither organization addresses the concepts and skills of social mathematics directly within their content standards and there is little more than circumstantial evidence to suggest that either organization indirectly addresses the concepts and skills of social mathematics within other sections of their national standards documents. This suggests the possibility that the editors of the *Curriculum Standards for Social Studies* and the *National Standards for Civics and Government* recognize that while social mathematics may indeed play a role in civics education, it would be in other discipline areas where such instruction and practice would take place. In other words, it is possible that both organizations expect that the skills of social mathematics are really the domain and responsibility of another discipline, and that somehow students will naturally make the connection between the mathematical and statistical concepts and skills they learn and apply in another discipline to the social mathematics they are to learn and apply through civic participation. This conclusion may serve to explain why both organizations identify as “skills of the social studies” the skills of evaluation, analysis, and comparison, yet make little or no mention of the roles that mathematics and statistics can play in more fully developing these skills in future citizens.

The analyses conducted within this chapter provide several important conjectures to compare and contrast with how the states of California, Texas, and Florida conceptualize a role for social mathematics within their civics courses, as well as how Person Education conceptualizes this same role in their nationally marketed civics textbook *Magruder's American Government*. The first such conjecture is that national organizations such as the National Council for the Social Studies and the Center for Civic Education simply do not recognize that social mathematics is an important component of a civic education. The second conjecture is that national organizations such as the National Council for the Social Studies and the Center for Civic Education recognize that social mathematics is a skill of the social studies and as such does not receive much “press” in the published themes, standards, or performance expectations. The third conjecture is that national organizations such as the National Council for the Social Studies and the Center for Civic Education recognize that, while social mathematics may encompass skills that should be applied in civics education, it is the responsibility of other academic disciplines to teach students the mathematical and statistical skills that embody much of social mathematics.

These three conjectures will be applied to the analysis conducted in the next two chapters that examine the state content standards of California, Texas, and Florida, as well as the nationally marketed *Magruder's American Government*. Do these state standards or *Magruder's* support or refute one (or more) of these conjectures? The next chapter will address the issue of how the three aforementioned states recognize social mathematics, and what that recognition reveals about state support for including the concepts and skills of social mathematics in civics courses.

Chapter 5

An Analysis of the State Content Standards of Texas, California, and Florida

In this chapter, an analysis of specific social studies standards of the states of Texas, California, and Florida is presented. For each set of state standards, two general classifications are provided. The first classification of standards serves to illustrate how specific state standards do not reflect basic tenets of social mathematics. This is done to illustrate how certain state content standards that do not explicitly or implicitly address social mathematical concepts or skills were selected for elimination from further consideration. The second classification serves to illustrate how specific state standards directly, indirectly, or potentially address basic tenets of social mathematics. In these cases, a detailed analysis of each standard is provided to illustrate how and in what ways the standard directly, indirectly, or potentially addresses social mathematical concepts and skills. Both types of classifications are used in this chapter to aid the reader in understanding why some standards were chosen as examples of addressing social mathematics while others were eliminated from further consideration and analysis. The results of these analyses are used to develop several conclusions regarding how the state social studies content standards adopted by California, Texas, and Florida address the concepts and skills of social mathematics. Additionally, several conjectures that stem from these conclusions are offered.

How State Social Studies Content Standards Were Selected For Consideration

Chapter 3 provided a detailed description of how specific social studies courses offered by school districts in Texas, Florida, and California were selected for inclusion in this study. The three courses identified were as follows: *United States Government* (Texas), *Political Science* (Florida), and *Principles of American Democracy* (California). California and Texas align specific state social studies content standards with every course offered in grades K through 12. The state of Florida does not align social studies content standards with specific courses; rather, the content standards are grouped by grade and by topic. All three of these sets of state standards as they apply to *United States Government* (Texas), *Political Science* (Florida), and *Principles of American Democracy* (California) are analyzed in this chapter for instances of inclusion of the concepts and skills of social mathematics (see Table 3.4) as they relate to civics instruction.

Content Standards for Social Studies (*United States Government*), State Of Texas

As mentioned in the preceding paragraph, the state of Texas aligns social studies content standards with specific courses. In this case, the course of interest to this study is *United States Government*, a required course offered in the twelfth grade. The Texas Education Agency (TEA) publishes 81 standards for *United States Government*, spread among the following eight major categories (p. C-1-C-38):

1. History
2. Geography
3. Economics
4. Government
5. Citizenship
6. Culture
7. Science, Technology, and Society
8. Social Studies Skills

The first step in the process of analysis was to review each standard to readily identify those social studies content standards that did not, in any direct or indirect manner, address any of the concepts and skills of social mathematics. As is to be expected of an analysis of the social studies content standards of any state, this initial analysis revealed that there was a number of content standards that could be dismissed from further analysis because they do not implicitly nor explicitly deal with the concepts or skills of social mathematics. In the case of the Texas content standards for *United States Government*, 55 of the standards (approximately 68%) were analyzed and identified as standards that did not directly or indirectly include the concepts and skills of social mathematics. So that the reader may better understand the types of standards that were identified for elimination from further consideration in this study, three of those 55 standards appear below to serve as examples (2003, pp. C-31 – C-33):

> <u>B.1.B</u> *Identify the characteristics of classic forms of government such as absolute monarchy, authoritarianism, classical republic, despotism, feudalism, liberal democracy, and totalitarianism.*
>
> <u>B.2.D</u> *Identify significant individuals in the field of government and politics, including Abraham Lincoln, George Washington, and selected contemporary leaders.*
>
> <u>B.9.C</u> *Analyze the structure and functions of the judicial branch of government, including the federal court system and types of jurisdiction.*

Not one of these three standards deals explicitly or implicitly with the concepts and skills of social mathematics. For this reason, they are very much representative of the remaining 52 content standards identified as neither explicitly nor implicitly embracing social mathematical concepts. This is not to state that it is *impossible* for a teacher of *United States Government* to interpret any or all three of these standards (or the other similarly categorized 52 standards) as containing a social mathematical component. Perhaps not ironically, a similar argument – that "… almost every political issue … has a quantitative aspect" (1995, pp. 165-6) – has been made by John Allen Paulos. It might be possible, for example, to partially satisfy standard B.1.B by examining the ways in which the various forms of governments identified within the standard made use of numbers. It is conceivable that some social studies teachers might assign their students a project that focuses on a question similar to the following: *Do totalitarian regimes use numeric forms of social information (e.g.; the census) in different ways than those in power in a representative democracy?*

The same could be said for standard B.9.C. Could this standard not be interpreted to include making statistical comparisons of the populations residing within each federal court district in an attempt to explain, for example, the ages and races of the federal judges appointed to serve on these benches? Could statistical comparisons be drawn between the types of cases heard and decisions rendered in a given judicial district and the types of judges appointed to serve on the bench? Clearly, mathematical and statistical concepts and skills can be brought to bear on any socially created situation. Numbers can, and often do, present another point of view, another way of asking questions, and of discovering answers.

Yet these unreasonably broad mathematical interpretations of these two social studies standards serve to illustrate the exception, not the rule. The issue of importance to this study is identifying those social studies content standards which are either likely to be interpreted by teachers as addressing social mathematical concepts and skills, or are likely to push teachers to address social mathematical concepts and skills in order to completely satisfy the content standard to a reasonable degree of quality. The 55 content standards identified as neither explicitly nor implicitly addressing the concepts and skills of social mathematics fail to satisfy either one of these “litmus tests.” In other words, these standards are neither likely to be interpreted by state educational officials, district personnel, parents, teachers, or students as addressing social mathematical concepts and skills, nor are they likely to push teachers to address social mathematics.

It is important to remember that the Texas social studies content standards, like the social studies content standards of the states of California and Florida, were written for social studies teachers. Because of this, it seems reasonable to exclude the 55 identified content standards from further consideration in this study simply because it would prove the exception, not the rule, if a social studies teacher were to interpret any of the 55 identified Texas content standards in such an overtly mathematical and statistical fashion. While it may indeed be true that “numbers are everywhere”, one must be cognizant of the fact that those teachers who are charged with following and successfully addressing every one of the 81 Texas state content standards are social studies teachers limited in time and energy. Barring a social studies teacher with an overzealous mathematical and statistical bent, it is unlikely that the majority of social studies teachers within the state of Texas would interpret any of the 55 content standards identified for elimination from consideration as opportunities to include substantive instruction in, or practice with, the concepts and skills of social mathematics.

The 26 social studies content standards that remain represent approximately 32% of the total number of Texas social studies standards. Each of these 26 standards was carefully analyzed to reveal some of the ways in which it can be interpreted to include tenets of social mathematics, and each appears in the following paragraphs and in its entirety in Table 5.1. If substantive state support for the instruction in, or practice with, social mathematics is to be found as a result of satisfying a given standard, it is reasonable to assume that such instruction and practice most likely occurs through the satisfaction of the following standards.

Texas state content standards B.2.A, B.2.B, and B.2.C represent three of the aforementioned standards that implicitly contain some tenets of social mathematics (2003, p. C-31):

B.2.A Analyze the principles and ideas that underlie the Declaration of Independence and the U.S. Constitution, including those of Thomas Hobbes, John Locke, and Charles de Montesquieu.

B.2.B Analyze the contributions of the political philosophies of the Founding Fathers, including John Adams, Alexander Hamilton, Thomas Jefferson, and James Madison, on the development of the U.S. Government.

B.2.C Analyze debates and compromises necessary to reach political decisions using historical documents.

I present these three content standards together because they require Texas school students to analyze certain principles fundamental to the development of the United States Government. While it is reasonable to expect that the amount and depth of analysis will vary from classroom to classroom, it is difficult to conceive of an analysis of the principles and ideas that underlie the United States Constitution without dealing substantively with the companion issues of representation, taxation, and enumeration. All three have significant theoretical and practical considerations, few of which were lost on the founding

Table 5.1

Texas Standards for United States Government Identified As Potentially Addressing Social Mathematical Concepts (pp. C-30 – C38)

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.2.A	*Analyze the principles and ideas that underlie the Declaration of Independence and the U.S. Constitution, including those of Thomas Hobbes, John Locke, and Charles de Montesquieu.*	Collecting and measuring data; Resource management and allocation; Understanding proportion; Understanding ratio and rate; Understanding interest
B.2.B	*Analyze the contributions of the political philosophies of the Founding Fathers, including John Adams, Alexander Hamilton, Thomas Jefferson, and James Madison, on the development of the U.S. Government.*	Collecting and measuring data; Resource management and allocation; Understanding proportion; Understanding ratio and rate; Understanding interest
B.2.C	*Analyze debates and compromises necessary to reach political decisions using historical documents.*	Collecting and measuring data; Resource management and allocation; Understanding proportion; Understanding ratio and rate; Understanding interest
B.3.A	*Give examples of the process used by individuals, political parties, interest groups, or the media to affect public policy.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Drawing original conclusions from data
B.3.B	*Analyze the impact of political changes brought about by individuals, political parties, interest groups, or the media, past and present.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Analyzing conclusions drawn from data; Drawing original conclusions from data

Table 5.1 (cont.)

Texas Standards for *United States Government* Identified As *Potentially* Addressing Social Mathematical Concepts

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.4.B	*Analyze the economic significance to the United States of the location and geographic characteristics of selected places and regions such as oil fields in the Middle East.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Analyzing conclusions drawn from data; Drawing original conclusions from data
B.5.A	*Analyze and evaluate the consequences of a government policy that affects the physical environment of a place or region.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Drawing original conclusions from data
B.5.B	*Analyze and evaluate the consequences of a government policy that affects the human characteristics of a place or region.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Drawing original conclusions from data

Table 5.1 (cont.)

Texas Standards for *United States Government* Identified As *Potentially* Addressing Social Mathematical Concepts

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.6.A	*Analyze government policies that influence the economy at the local, state, and national levels.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Drawing original conclusions from data
B.6.B	*Identify the sources of revenue and expenditures of the U.S. Government and analyze their impact on the U.S. economy.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Understanding interest; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data
B.6.C	*Compare the role of government in the U.S. free enterprise system and other economic systems.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data
B.8.E	*Analyze the processes by which the U.S. Constitution can be changed and evaluate their effectiveness.*	Collecting and measuring data; Analyze conclusions drawn from data; Drawing original conclusions from data

Table 5.1 (cont.)

Texas Standards for *United States Government* Identified As *Potentially* Addressing Social Mathematical Concepts

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.11.B	*Analyze and evaluate the process of electing the President of the United States.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data
B.12.B	*Analyze the two-party system and evaluate the role of third parties in the United States.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data
B.12.C	*Analyze the role of political parties in the electoral process at local, state, and national levels.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data
B.15.D	*Analyze the consequences of political decisions and actions on society.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data

Table 5.1 (cont.)

Texas Standards for *United States Government* Identified As *Potentially* Addressing Social Mathematical Concepts

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.16.A	*Analyze the effectiveness of VARIOUS methods of participation in the political process at local, state, and national levels.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data
B.18.B	*Analyze changes in American culture brought about by government policies such as voting rights, the GI bill, and racial integration.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data
B.18.C	*Describe an example of a government policy that has affected a particular racial, ethnic, or religious group*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data
B.20.A	*Analyze the potential impact on society of recent scientific discoveries and technological innovations.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data

Table 5.1 (cont.)

Texas Standards for *United States Government* Identified As *Potentially* Addressing Social Mathematical Concepts

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.21.A	*Analyze information by sequencing, categorizing, identifying cause-and-effect relationships, comparing, contrasting, finding the main idea, summarizing, making generalizations and predictions, and drawing inferences and conclusions.*	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, and mode; Interpreting maps, charts, graphs, timelines, etc. that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Drawing original conclusions from data
B.21.E	*Evaluate government data using charts, tables, graphs, and maps.*	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, and mode; Interpreting maps, charts, graphs, timelines, etc. that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Drawing original conclusions from data

Table 5.1 (cont.)

Texas Standards for *United States Government* Identified As *Potentially* Addressing Social Mathematical Concepts

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.21.F	*Use appropriate mathematical skills to interpret social studies information such as maps and graphs.*	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, and mode; Interpreting maps, charts, graphs, timelines, etc. that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Understanding interest; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data
B.22.C	*Transfer information from one medium to another, including written to visual and statistical to written or visual, using computer software as appropriate.*	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, and mode; Interpreting maps, charts, graphs, timelines, etc. that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Understanding interest; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data

Table 5.1 (cont.)

Texas Standards for United States Government *Identified As* Potentially *Addressing Social Mathematical Concepts*

Standard #	***Texas State Standard***	***Social Mathematical Concepts****
B.23.A	*Use a problem-solving process to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution, and evaluate the effectiveness of the solution.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data
B.23.B	*Use a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences, and take action to implement a decision.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Drawing original conclusions from data

*This column represents the content and skills of social mathematics (see Table 3.4) that it is reasonable to expect would be addressed through a broad interpretation of the corresponding state standard. Note that, due to considerations of length, some of the concepts and skills of social mathematics are slightly abbreviated. In any case where a skill or concept was abbreviated, an effort was made to retain the scope and meaning of the original skill or concept as stated in Table 3.4: *Instruction and Practice in Social Mathematics.*

fathers. Representation, taxation, and enumeration are not only of historical interest and significance; both are fundamental issues of current importance. If by "analyze", some members of the Texas Education Agency interpret this to mean that students should be asked and given the opportunity to answer why certain ideas and practices were adopted and what the arguments that surrounded the adoption of those ideas and practices were, then it is reasonable to assume that members of the Texas Education Agency expect that students within the state's social studies classrooms would delve substantively into exercises in collecting, measuring, and interpreting data, as well as practice designed to help students understand resource management and allocation, proportion, ratio, rate, and apportionment – all concepts and skills of social

mathematics.

B.3.A *Give examples of the process used by individuals, political parties, interest groups, or the media to affect public policy*. (2003, p. C-31)

It seems reasonable to assume that members of the Texas Education Agency would expect that social studies teachers and students would discuss the role of political action committees (PACs) and voting as examples of ways that individuals and organizations affect public policy. Standard B.3.A asks that Texas students only be able to name examples of the ways that individuals and organizations affect public policy. This may imply that no concept or skill of social mathematics would be addressed through satisfying this standard. Yet this more narrow interpretation seems lacking, and that is why standard B.3.A is included among those Texas state content standards that seem to address tenets of social mathematics. It seems reasonable to expect that, in order to be included as examples of the ways that individuals and organizations affect public policy, the effectiveness of voting and PACs (as well as other ways in which individuals and organizations affect public policy) would need to be discussed. One of the most important ways to measure the effectiveness of a certain treatment (in this case, voting and money) is through statistical analysis and comparison. A similar argument can be made for Texas state content standard B.3.B (2003, p. C-31):

B.3.B Analyze the impact of political changes brought about by individuals, political parties, interest groups, or the media, past and present.

Texas state content standard B.3.B is only satisfied when analysis has taken place. Similar to standard B.3.A, it is reasonable to assume that members of the Texas Education Agency expect that teachers who wish to fulfill standard B.3.B would include voting and money as two significant agents of political change. As also noted in the preceding section on standard B.3.A, it reasonable to expect that, in discussing the myriad of ways in which voting and money have affected political change, some kind of statistical analysis would need to take place.

In addition to the five history content standards to be addressed through the study of *United States Government* presented above, there are three geography content standards worthy of further consideration. Texas state social studies content standards for *United States Government* include the following three standards listed under the sub-heading of geography (2003, p. C-32):

B.4.B *Analyze the economic significance to the United States of the location and geographic characteristics of selected places and regions such as oil fields in the Middle East.*

B.5.A *Analyze and evaluate the consequences of a government policy that affects the physical environment of a place or region.*

B.5.B *Analyze and evaluate the consequences of a government policy that affects the human characteristics of a place or region.*

Much like other content standards of the state of Texas presented within this section, standards B.4.B, B.5.A, and B.5.B require students to analyze and evaluate given ideas, actions, changes, and consequences. It is reasonable to assume that social mathematical principles would play a role in any meaningful analysis or evaluation. It is simply ineffective to rely on one form of analysis and evaluation (anecdotal, for example) to bring about a more complete and unbiased analysis. This is not to suggest that a comparative analysis using numbers and statistics is free of bias – quite the contrary, as John Allen Paulos pointed out – it is to suggest that social mathematics can help to provide students with a more complete and balanced analysis. Whether or not social studies teachers in Texas (or any other state, for that matter) recognize the utility of social mathematics in helping their students meet a given content standard is debatable and not the primary focus of this study. The question is: W*here are tenets of social mathematics most likely to be addressed within state content standards?*

Several other state content standards selected for further analysis in this section also require social studies students to analyze and evaluate ideas, actions, changes, and consequences. As previously stated, it is reasonable to expect that it is within these standards that tenets of social mathematics are most likely to be addressed, albeit perhaps implicitly (2003, pp. C32 –C-37):

> B.6.A *Analyze government policies that influence the economy at the local, state, and national levels.*
>
> B.6.B *Identify the sources of revenue and expenditures of the U.S. Government and analyze their impact on the U.S. economy.*
>
> B.6.C *Compare the role of government in the U.S. free enterprise system and other economic systems.*
>
> B.8.E *Analyze the processes by which the U.S. Constitution can be changed and evaluate their effectiveness.*
>
> B.11.B *Analyze and evaluate the process of electing the President of the United States.*
>
> B.12.B *Analyze the two-party system and evaluate the role of third parties in the United States.*
>
> B.12.C *Analyze the role of political parties in the electoral process at local, state, and national levels.*
>
> B.15.D *Analyze the consequences of political decisions and actions on society.*
>
> B.16.A *Analyze the effectiveness of VARIOUS methods of participation in the political process at local, state, and national levels.*
>
> B.18.B *Analyze changes in American culture brought about by government policies such as voting rights, the GI bill, and racial integration.*
>
> B.18.C *Describe an example of a government policy that has affected a particular racial, ethnic, or religious group*
>
> B.20.A *Analyze the potential impact on society of recent scientific discoveries and technological innovations.*

As previously noted, all of these content standards deal substantively with analysis of cultural, economic, religious, political, or social phenomenon. In every case, it is entirely appropriate to employ social mathematics as a tool for comparative analysis.

Historic numeric data such as voting records and patterns, financial expenditures, gross national product, population shifts, and a host of other largely numeric measures can be used to effectively analyze cause-and-effect and other relationships among social data, or to analyze and evaluate the effectiveness of a particular program or policy.

Three additional state content standards implicitly address tenets of social mathematics, but in a manner different than those standards listed above. Standards B.21.A, B.23.A, and B.23.B are enumerated under the sub-heading of "social studies skills" (2003, pp. C-37 – C-38):

> B.21.A *Analyze information by sequencing, categorizing, identifying cause-and-effect relationships, comparing, contrasting, finding the main idea, summarizing, making generalizations and predictions, and drawing inferences and conclusions.*
>
> B.23.A *Use a problem-solving process to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution, and evaluate the effectiveness of the solution.*
>
> B.23.B *Use a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences, and take action to implement a decision.*

Not one of these three content standards makes use of the words "mathematics" or "statistics" in describing the knowledge and skills that students of the social studies are to learn and practice through satisfying these standards. It could indeed be the case that the types of words included within these standards – *prediction*, *problem solving*, *options*, *solutions* – are not intended to be interpreted in a mathematical or statistical fashion, but one that is more verbal in nature. It is certainly possible to predict, solve problems, list options, and find solutions without the use of numbers and statistics. Yet much like the other Texas state content standards identified in this section, it is relatively easy to understand why social studies teachers might feel compelled to include instruction in social mathematics to help satisfy both standards. Standard B.21.A includes the words *categorize* and *sequence*, actions that would require students to make use of numbers and order, even if applying those numbers and order to verbal (as opposed to numeric) data. Even if the problem and problem-solving process alluded to in standard B.23.A is purely verbal in nature, the action of evaluating the effectiveness of the solution is a step in which it is conceivable that some social mathematics would be included. A similar argument can be made for standard B.23.B. The decision-making process, and indeed the decision itself, need not explicitly nor implicitly embrace a mathematical or statistical component. Yet it seems difficult to fathom that any consequence of a decision could be predicted without employing some probability and statistics.

Clearly, the majority of Texas social studies content standards as they apply to *United States Government* do not seem to reflect any commitment on the part of the Texas Education Agency for mandating instruction in the concepts and skills of social mathematics. Some of the Texas social studies content standards may indeed reflect some amount of commitment to instruction in social mathematics on the part of the Texas Education Agency.

This is not to suggest that the Texas Education Agency does not make significant overtures in *explicitly* recognizing the role that statistics and mathematics can play in a civic education. Among the states considered for this study, Texas is the only state to directly correlate the importance of mathematics and statistics with civic instruction. Consider the following three social studies content standards for *United States Government* (2003, pp. C-37 – C-38):

<u>B.21.E</u> *Evaluate government data using charts, tables, graphs, and maps.*

B.21.F *Use appropriate mathematical skills to interpret social studies information such as maps and graphs.*

B.22.C *Transfer information from one medium to another, including written to visual and statistical to written or visual, using computer software as appropriate.*

The concepts and skills identified in Texas state content standards B.21.E, B.21.F, and B.22.C include some of the exact same concepts and skills identified by Michael Hartoonian in "Social Mathematics" (1989). It is clear that if Texas social studies teachers satisfy every one of the content standards they are charged with addressing, these three standards would require them to teach, as well as provide their students with substantial practice in, the concepts and skills of social mathematics. This lends credence to the conclusion that there is indeed support and commitment on the part of the Texas Education Agency for instruction in the concepts and skills of social mathematics in *United States Government*.

Conclusions Pertinent to the Texas Standards

An analysis of the Texas social studies content standards as they apply to *United States Government* reveals that the majority of them (approximately 68%) do not explicitly nor implicitly address social mathematical concepts and skills. It is unreasonable to expect that, in fulfilling the majority of the Texas content standards, teachers of the social studies would interpret any of these standards to include directives to teach the concepts and skills of social mathematics. It is equally unreasonable to expect or conclude that the Texas Education Agency intended teachers of the social studies to interpret the 55 standards eliminated from inclusion in this study in any way as a mandate to teach the concepts and skills of social mathematics. These 55 standards reflect the kinds of traditional subjects that most parents, teachers, and students likely associate with government and civics, topics such as how a bill becomes a law, the "checks and balances" of the United States Government, and the Bill of Rights.

While it is true that the majority of the social studies content standards of the state of Texas do not directly or even indirectly address concepts and skills of social mathematics, it is possible that the authors and consumers of social mathematics may interpret 26 of the 81 (approximately 32%) social studies content standards as including the concepts and skills of social mathematics (category 2, 3, and 4 standards). Though I analyzed these social studies standards as part of the preceding section, they are further categorized for analysis in Table 5.2. This table includes every social studies content standard developed by the Texas Education Agency pursuant to the teaching of *United States Government*. Table 5.2 was developed to illustrate the degree to which it can be reasonably expected that teachers of *United States Government* may interpret a given social studies standard to include instruction and practice in social mathematics. Each content standard for *United States Government* is represented in one of four categories. These 4 categories are the same 4 categories used in the previous chapter to analyze the national content standards published by the National Council for the Social Studies and the Center for Civic Education. Recall that category 1 includes all state standards that do not directly or indirectly address concepts and skills of social mathematics. Category 2 includes those content standards that, while possibly addressing concepts of skills of social mathematics indirectly, are not likely to be interpreted as doing so by the authors and consumers of the standard in question. Category 3 includes those content standards that are likely to be interpreted by the authors and consumers of the standard in question as addressing concepts and skills of social mathematics.

Table 5.2

The 81 Texas Social Studies Content Standards For *United States Government,*
Referenced By Category

Category 1	Category 2	Category 3	Category 4
B.1.A, B.1.B B.2.D B.4.A B.7.A, B.7.B B.8.A, B.8.B, B.8.C, B.8.D, B.8.F B.9.A, B.9.B, B.9.C, B.9.D, B.9.E, B.9.F, B.9.G, B.9.H, B.9.I B.10.A, B.10.B, B.10.C, B.10.D B.11.A B.12.A, B.12.D B.13.A, B.13.B, B.13.C B.14.A, B.14.B, B.14.C, B.14.D, B.14.E, B.14.F B.15.A, B.15.B, B.15.C B.16.B, B.16.C, B.16.D B.17.A, B.17.B, B.17.C B.18.A B.19.A, B.19.B, B.20.B B.21.B, B.21.C, B.21.D B.22.A, B.22.B, B.22.D	B.2.A, B.2.B, B.2.C B.3.A, B.3.B B.5.A, B.5.B B.6.C B.8.E B.11.B B.12.B, B.12.C B.15.D B.16.A B.18.B, B.18.C B.20.A	B.4.B B.6.A, B.6.B B.21.A B.23.A, B.23.B	B.21.E, B.21.F B.22.C
55 total (67.9%)*	**17 total (20.9%)***	**6 total (7.4%)***	**3 total (3.7%)***

*Due to rounding, percentages may not add to 100%.

Category 4 includes those content standards that directly address the concepts and skills of social mathematics through clear and unambiguous language. The respective percentages in each category appear at the bottom of the appropriate column.

Those Texas social studies content standards that do not directly or indirectly address the concepts and skills of social mathematics make up the largest single category (approximately 68%). The next largest of the categories of content standards is category 2, which represents those content standards that, while possibly addressing concepts of skills of social mathematics indirectly, are not likely to be interpreted as doing so by the authors and consumers of these standards (approximately 21%). This suggests that the majority (nearly 89%) of the Texas social studies content standards written for *United States Government* do not directly or indirectly include concepts and skills of social mathematics or that they are not likely to be interpreted in this way by authors and consumers of these standards. This leaves nine social studies standards (approximately 11%) that either are likely to be interpreted by the authors and consumers of these standards to include concepts and skills of social mathematics, or do actually include these concepts and skills. Of these 9 identified content standards, only 3 (approximately 4%) directly address concepts and skills of social mathematics.

What is significant about this conclusion is that it lends credence to one of the three conjectures offered in the concluding section of the previous chapter: The authors and consumers of these standards recognize social mathematics as a skill of the social studies in general and because of this, social mathematics may not be reflected in the actual content standards. Recall that the state of Texas groups all of the social studies content standards into eight major categories (pp. C-1 – C-38):

1. History
2. Geography
3. Economics
4. Government
5. Citizenship
6. Culture
7. Science, Technology, and Society
8. Social Studies Skills

When the three content standards identified under category four in Table 5.2 are aligned with the eight major content standard categories, it reveals that all three standards (B.21.E, B.21.F, and B.22.C) are listed under the major content standard *social studies skills* (category 8). These three standards represent 25% of the total number of content standards listed under category 8. I identify an additional three content standards (B.21.A, B.23.A, and B.23.B) as standards that are likely to be interpreted by the authors and consumers of these standards as addressing concepts and skills of social mathematics (category 3 standards). Stated differently, half of the content standards listed under *social studies skills* either directly address concepts and skills of social mathematics or are likely to be interpreted by the authors and consumers of these standards as addressing these concepts and skills. This finding is significant because it reveals that the major content standard category of *social studies skills* contains substantive amounts of social mathematics. This would suggest that one of the eight major content standards (approximately 13%) is substantially represented by content sub-standards that contain language that either directly addresses concepts and skills of social mathematics or is likely to be interpreted by the authors and consumers of these standards as addressing these concepts and skills. From this perspective, it would seem that there is additional supporting evidence that the Texas Education Agency supports more instruction in social mathematics within *United States Government* than originally suggested by the conclusion that approximately 4% of the content standards directly address social mathematics.

This finding is significant because it suggests that the Texas Education Agency may view social mathematics in a similar manner to the way that the National Council for the Social Studies and the Center for Civic Education may view social mathematics. It is possible that all three organizations view social mathematics as a skill of the social studies. This may serve to explain why the concepts and skills of social mathematics are not reflected within the content standards published by the National Council for the Social Studies, the Center for Civic Education, or the Texas Education Agency. When, as indicated in the analysis conducted for the preceding section, the concepts and skills of social mathematics do appear within 4% of the content standards published by the Texas Education Agency, those standards are categorized as *social studies skills*.

There is, of course, the related issue of *quality* when it comes to discerning the level of commitment the Texas Education Agency has to instruction in social mathematics. When addressing the notion of the quality of content standards, there are two related issues to consider. The first is how completely a set of content standards addresses the identified tenets of social mathematics (see chapter 3, Table 3.4). The second is how well a set of content standards addresses the six levels of social mathematics as identified in the social mathematics rubric (see chapter 3, Table 3.3).

What is important to recognize when discussing the quality of any of the Texas social studies standards is that *only the language of the content standard itself can be analyzed*. Because of this, only the three standards (B.21.E, B.21.F, and B.22.C) identified as category 4 content standards in Table 5.2 were included in the following analyses of quality. While Table 5.2 also includes 23 additional content standards listed under categories 2 and 3, recall that category 2 and 3 represent those content standards in which it is *possible* to interpret as including social mathematics. Since teachers, parents, members of the TEA, school board officials, school district officials, and others will interpret these content standards as they apply to social mathematics in different ways, it is impossible to make definitive statements regarding the quality of these content standards.

Three content standards, B.21.E, B.21.F, and B.22.C, are the only standards that unambiguously address content and skills of social mathematics (2003, pp.; C-37 – C-38):

> B.21.E *Evaluate government data using charts, tables, graphs, and maps.*
>
> B.21.F *Use appropriate mathematical skills to interpret social studies information such as maps and graphs.*
>
> B.22.C *Transfer information from one medium to another, including written to visual and statistical to written or visual, using computer software as appropriate.*

As noted earlier, the fact that these content standards are included in the social studies content standards for *United States Government* suggests that there is some level of commitment on the part of the Texas Education Agency to mandate some amount of instruction in social mathematics. What do these three content standards reveal about the level of commitment the Texas Education Agency has when it comes to the *quality* of this instruction? The information in Table 3.3 (*Social Mathematics Rubric*) and Table 3.4 (*Instruction and Practice In Social Mathematics*) was used to determine the level of quality of standards B.21.E, B.21.F, and B.22.C. Table 5.3 represents the alignment of

Table 5.3

Category 4 Social Studies Standards of the State of Texas That Directly Address Tenets of Social Mathematics

Standard #	***Texas State Standard***	**Corresponding Tenets of Social Mathematics Concepts**	**Corresponding Level In The Social Mathematics Rubric**
B.21.E	*Evaluate government data using charts, tables, graphs, and maps.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data. Drawing original conclusions from data	Level 1- Instructs how or asks students to identify numeric data Level 4- Instructs how or asks students to draw their own conclusions/solutions from provided data
B.21.F	*Use appropriate mathematical skills to interpret social studies information such as maps and graphs.*	Dispersion Mean, median, mode, average and central tendency Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data. Statistical outliers in data	Level 1- Instructs how or asks students to identify numeric data Level 4- Instructs how or asks students to draw their own conclusions/solutions from provided data
B.22.C	*Transfer information from one medium to another, including written to visual and statistical to written or visual, using computer software as appropriate.*	Translating written, verbal, or other forms of information into mathematical or statistical formats (and the converse of this)	Level 2 - Instructs how or asks students to translate verbal or written information into numerical or statistical form

the three category 4 Texas content standards identified in Table 5.2 with the corresponding tenets of social mathematics they address. In addition, a column is included that depicts the results of applying the social mathematics rubric (Table 3.3) to the three standards. Additionally, Table 5.4 juxtaposes these same three standards with the remaining 10 (approximately 63%) tenets of social mathematics that the three standards do not address.

Depending on the data, chart, table, graph, or map to be interpreted and evaluated, the number of tenets of social mathematics that could theoretically be addressed by content standards B.21.E, B.21.F, and B.22.C could rise dramatically. Given the nature of the language used in these content standards, Table 5.3 likely represents the minimum number of tenets of social mathematics met through the satisfaction of these standards. That stated, these three category 4 content standards directly address 6 of the 16 (approximately 38%) tenets of social mathematics as identified in Table 3.4. This is a surprising figure given that only three content standards qualify for this analysis. It would indeed seem as if the state of Texas is committed to the idea that social studies teachers of *United States Government* should be teaching their students about a number of basic principles of social mathematics.

Applying the social mathematics rubric (see Table 3.3) to content standards B.21.E, B.21.F, and B.22.C demonstrates that the Texas Education Agency is not only committed to the instruction of a substantial minority of the basic tenets of social mathematics, but also to the idea that social studies teachers should be providing their students with practice with these concepts and skills as well (see Table 5.4). The application of the social mathematics rubric suggests that, while the levels of practice

Table 5.4

Category 4 Social Studies Standards of the State of Texas And Their Corresponding Levels in the Social Mathematics Rubric

#	*Standard*	**Corresponding Tenets of Social Mathematics Directly Addressed**	**Remaining Concepts and Skills of Social Mathematics Not Addressed**
B.2 1.E	*Evaluate government data using charts, tables, graphs, and maps.*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data. Drawing original conclusions from data	Probability and chance Sampling and margin of error Dispersion Mean, median, mode, average and central tendency Collecting and measuring data Communicating statistical conclusions to others Statistical outliers in data Analyzing conclusions drawn from data Understanding interest Understanding proportion Understanding ratio and rate Drawing conclusions from original data collected as part of an original poll, study or project Translating written, verbal, or other forms of information into numerical and statistical formats (and the converse of this)
B.2 1.F	*Use appropriate mathematical skills to interpret social studies information such as maps and graphs.*	Dispersion Mean, median, mode, average and central tendency Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data. Statistical outliers in data	Drawing original conclusions from data Sampling and margin of error Collecting and measuring data Communicating statistical conclusions to others Analyzing conclusions drawn from data Understanding interest Understanding proportion Understanding ratio and rate Drawing conclusions from original data collected as part of an original poll, study or project Translating written, verbal, or other forms of information into numerical and statistical formats (and the converse of this)
B.2 2.C	*Transfer information from one medium to another, including written to visual and statistical to written or visual, using computer software as appropriate.*	Translating written, verbal, or other forms of information into mathematical or statistical formats (and the converse of this)	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data. Drawing original conclusions from data Sampling and margin of error Dispersion Mean, median, mode, average and central tendency Collecting and measuring data Communicating statistical conclusions to others Statistical outliers in data Analyzing conclusions drawn from data Understanding interest Understanding proportion Understanding ratio and rate Drawing conclusions from original data collected as part of an original poll, study or project

remain well within the realm of *interpreting* and *evaluating* information provided by the teacher or the text (as opposed to students developing their own authentic problems and solutions through which to apply the concepts and skills of social mathematics), the Texas Education Agency mandates that social studies teachers do provide their students with practice – not just instruction – in social mathematics.

Content Standards For Social Studies (*Principles of American Democracy*), State Of California

The social studies content standards for the state of California are published as the *History-Social Science Framework for California Public Schools, Kindergarten Through Grade Twelve* (2001 updated Edition), printed by the California Department of Education. This document summarizes each course offered to students of California's public school system, beginning with *Learning and Working Now and Long Ago* (kindergarten) and ending with *Principles of American Democracy* and *Economics* (separate one semester courses offered in twelfth grade). Each course description includes both the state content standards as they apply to that particular course, as well as a descriptive narrative of the types of subjects and skills to be taught as part of the course. The major subjects to be included in *Principles of American Democracy* include (2001, pp.158-163):

1. The Constitution and the Bill of Rights
2. The Courts and the Governmental Process
3. Our Government Today: The Legislative and Executive Branches
4. Federalism: State and Local Government
5. Comparative Governments, With Emphasis on Communism in the World
6. Contemporary Issues in the World Today

Table 5.5

Principle State Content Standards for Principles Of Democracy*

12.1 Students explain the fundamental principles and moral values of American democracy as expressed in the U.S. Constitution and other essential documents of American democracy.

12.2 Students evaluate and take and defend positions on the scope and limits of rights and obligations as democratic citizens, the relationships among them, and how they are secured.

12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their interdependence, and the meaning and importance of those values and principles for a free society.

12.4 Students analyze the unique roles and responsibilities of the three branches of government as established by the U.S. Constitution.

12.5 Students summarize landmark U.S. Supreme Court Interpretations of the Constitution and its amendments.

12.6 Students evaluate issues regarding campaigns for national, state, and local elective offices.

12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.

12.8 Students evaluate and take and defend positions on the influence of the media on American political life.

12.9 Students analyze the origins, characteristics, and development of different political systems across time, with emphasis on the quest for political democracy, its advances, and its obstacles.

12.10 Students formulate questions about and defend their analyses of tensions within our constitutional democracy and the importance of maintaining a balance between the following concepts: majority rule and individual rights; liberty and equality; state and national authority in a federal system; civil disobedience and the rule of law; freedom of the press ad the right to a fair trial; the relationship of religion and the government.

* These principle content standards appear on pages164-168 of the *History-Social Science Framework for California Public Schools*

There are ten principle content standards to be addressed in *Principles of American Democracy* (see Table 5.5). Each principle content standard is elaborated more fully in between three to eight additional sub-standards totaling 51 content standards for analysis in this section.

Similar to the analysis conducted for the state content standards of Texas, the first step in the process of analysis of the California social studies standards was to carefully review each standard in such a way as to readily identify those that did not, in any direct or indirect manner, address any of the concepts and skills of social mathematics. As is to be expected of an analysis of the social studies content standards of any state, this initial analysis revealed that there were a number of content standards that could be dismissed from further analysis because they do not directly or indirectly reflect concepts or skills of social mathematics. In the case of the California content standards for *Principles of American Democracy*, 41 of the standards (approximately 80%) were analyzed and identified as standards that did not directly or indirectly include the concepts and skills of social mathematics. So that the reader may better understand the types of standards that were identified for elimination from further consideration in this study, two of these 41 standards appear below to serve as examples (2001, pp. 164-5):

> <u>12.1.6</u> *Understand that the Bill if Rights limits the powers of the federal government and state governments.*
>
> <u>12.2.6</u> *Explain how one becomes a citizen of the United States, including the process of naturalization (e.g., literacy, language, and other requirements).*

Social mathematical concepts or skills are neither explicitly nor implicitly implied in standards 12.1.6 and 12.2.6. It would be a stretch to suggest, in the case of standard

12.1.6, that understanding that the Bill of Rights limits the powers of the federal and state governments requires any, even the most basic, understanding of mathematics and statistics. This is not to suggest that it would not be *possible* for a teacher of *Principles of American Democracy* to include some amount of mathematical or statistical instruction related to this particular content standard. It is conceivable that a teacher could ask the following question of her students: *If we ran a statistical analysis of Supreme Court decisions in cases involving challenges to the Bill of Rights, what would we find in respect to the Court's interpretation of limitations of powers of the state and federal government?* A reasonable question, perhaps, but not one likely to be asked by an average social studies teacher limited by the amount of time she has in the school year (in the case of California's *Principles of American Democracy*, one semester) unless she had some particular interest in statistics and mathematics.

A similar example can be found in standard 12.2.6 (2001, p. 165):

> 12.2.6 *Explain how one becomes a citizen of the United States, including the process of naturalization (e.g., literacy, language, and other requirements).*

Similar to the previous selection, this content standard does not directly or indirectly address concepts or skills of social mathematics. Again, it would be *possible* for a teacher of *Principles of American Democracy* to use social mathematics to address some aspect directly or indirectly related to this particular standard. For example, a teacher could develop a lesson that correlates an examination of historical "citizenship tests" with immigration records of Ellis Island and other ports of entry into the United States. The teacher could ask: *Statistically speaking, is there a correlation between citizenship tests and immigration? Do entry requirements change shortly after certain* *historical periods of immigration including periods of high immigration rates and particular countries of origin?* These are reasonable questions to ask of students and would also provide students with practical experience in data gathering and analysis, yet it seems as if the likelihood of a teacher incorporating so much mathematical and statistical practice to help satisfy the standard would be so low as to eliminate standard 12.2.6 from further analysis.

California's state content standards (both the 10 principle standards and the 51 content standards) for *Principles of American Democracy* do not reflect any overt attempt on the part of the California Board of Education to mandate instruction in, or practice with, the skills and concepts of social mathematics. Nowhere within any of the social studies content standards as they apply to *Principles of American Democracy*, or within the accompanying descriptive narrative for the course, are the words *social mathematics*, *mathematics*, *statistics*, or *quantitative literacy* (or any derivations of these words) to be found. Much like many of the content standards of the state of Texas, however, there are some social studies content standards published by the California Board of Education that seem more likely to have teachers interpret *Principles of American Democracy* as potentially addressing the concepts and skills of social mathematics than others (see Table 5.6). By this it is meant that it seems likely that some amount of mathematical or statistical concepts or skills could be addressed through satisfactorily completing some of California's social studies content standards as they apply to *Principles of American Democracy*.

10 of the 51 content standards (approximately 19%) of *Principles of American Democracy* would seem to indirectly or possibly address the concepts and skills of social

Table 5.6

California Standards For *Principles of American Democracy* Identified As *Potentially* Addressing Social Mathematical Concepts

Standard #	***California State Standard***	***Social Mathematical Concepts****
12.2.2	*Explain how economic rights are secured and their importance to the individual and to society (e.g., the right to acquire, use, transfer, and dispose of property; right to choose one's work; right to join or not to join labor unions; copyright and patent)*	Collecting and measuring data; Resource management and allocation; Understanding proportion; Understanding ratio and rate
12.2.4	*Understand the obligations of civic-mindedness, including voting, being informed on civic issues, volunteering and performing public service, and serving in the military or alternative service*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Analyzing conclusions drawn from data
12.3.2	*Explain how civil society makes it possible for people, individually or in association with others, to bring their influence to bear on government in ways than voting and elections*	Collecting and measuring data; Analyzing conclusions drawn from data
12.4.2	*Explain the process through which the Constitution can be amended*	Understanding proportion; Understanding ratio and rate; Mean, median, mode
12.6.3	*Evaluate the roles of polls, campaign advertising, and the controversies over campaign funding*	Collecting and measuring data; Sampling and margin of error; Dispersion, Mean, median, and mode; Resource management and allocation
12.6.4	*Describe the means that citizens use to participate in the political process (e.g., voting, campaigning, lobbying, filing a legal challenge, demonstrating, petitioning, picketing, running for political office)*	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Analyzing conclusions drawn from data
12.6.5	*Discuss the features of direct democracy in numerous states (e.g., the process of referendums, recall elections)*	Understanding proportion; Understanding ratio and rate; Mean, median, and mode

Table 5.6 (cont.)

California Standards For *Principles of American Democracy* Identified As Addressing Social Mathematical Concepts

Standard #	***California State Standard***	***Social Mathematical Concepts****
12.6.6	*Analyze trends in voter turnout; the causes and effects of reapportionment and redistricting, with special attention to spatial districting and the rights of minorities; and the function of the Electoral College*	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, and mode; Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Understanding proportion
12.7.2	*Identify the major responsibilities and sources of revenue for state and local governments*	Interpreting maps, charts, graphs, diagrams, timelines, etc., that depict mathematical or statistical data; Resource management and allocation; Understanding interest; Understanding proportion; Understanding ratio and rate
12.9.8	*Identify the successes of relatively new democracies in Africa, Asia, and Latin America and the ideas, leaders, and general societal conditions that have launched and sustained, or failed to sustain, them*	Interpreting maps, charts, graphs, diagrams, timelines, etc., that depict mathematical data; Resource management and allocation

* This column represents the content and skills of social mathematics (see Table 3.4) that it is reasonable to expect would be addressed through a broad interpretation of the corresponding state standard. Note that, due to considerations of length, some of the concepts and skills of social mathematics are slightly abbreviated. In any case where a skill or concept was abbreviated, an effort was made to retain the scope and meaning of the original skill or concept as stated in Table 3.4: *Instruction and Practice in Social Mathematics.*

mathematics (see Tables 5.6 and 5.7). The following pages present a chronological list of these 10 identified standards, each followed by an example of how concepts and skills of social mathematics would likely be addressed through fully addressing the particular content standard. All 51 content standards are further categorized in Table 5.7, entitled *The 51 California Content Standards For Principles of American Democracy Referenced By Category***.**

The first of these California content standards that indirectly address tenets of social mathematics is standard 12.2.2 (2001, p. 164):

> 12.2.2 *Explain how economic rights are secured and their importance to the individual and to society (e.g., the right to acquire, use, transfer, and dispose of property; right to choose one's work; right to join or not to join labor unions; copyright and patent).*

Fulfillment of this standard would likely involve a fairly comprehensive examination of how economic rights positively and negatively impact individuals and the society as a whole. It is reasonable to assume that most of this analysis would be mathematical or statistical in nature. Several questions could be posed to students, including: *In what ways are individual economic rights important to the overall economic health of society?* The evidence examined and used to support any answer to this question would need to incorporate some tenets of social mathematics. Numeric and statistical proof concerning taxation, local, state, or federal budgets, personal income – just to name a few examples – would likely be included in any discussion concerning how individuals contribute to the overall economic health of society.

Consider as well standard 12.2.4 (2001, p. 165):

> 12.2.4 *Understand the obligations of civic-mindedness, including voting, being informed on civic issues, volunteering and performing public service, and serving in the military or alternative service.*

Even if a member of the California Board of Education or teacher of *Principles of American Democracy* was or is unaware of, or remains unconvinced by the arguments espoused by authors like John Allen Paulos or Lynn Arthur Steen regarding the relationship between being quantitatively literate and being an informed citizen, it is difficult to ignore the mathematical (to say nothing of the political, economic, and social) implications of voting in an election. Certainly the 2000 presidential election, as well as several state and local elections in 2000, 2002, and 2004, serve as perfect real-life examples of the importance of every citizen's vote. Since it is reasonable to assume that most social studies teachers want their students to understand the importance of voting and indeed want them to vote when they come of age, it is reasonable to assume that some teachers would use the recent extraordinarily close election results to make their case (2001, p. 165).

> 12.3.2 *Explain how civil society makes it possible for people, individually or in association with others, to bring their influence to bear on government in ways other than voting and elections.*

To be sure, writing a letter to the President or to your local or state representative represents one traditional way in which students have been taught that they can influence policy and the actions of their elected officials. The explosive growth and influence of PACs (Political Action Committees) in recent decades illustrates a different, and often more powerful, way in which ordinary citizens bring their influence to bear on policy and political officials. PACs pour hundreds of millions of dollars into the political campaign system, and are widely credited with directly and indirectly affecting the outcome of races and altering public policy. It is reasonable to assume that the role that PACs play in influencing policy and politicians would be discussed in *Principles of American Democracy*, and that this discussion would include how money influences policy, politics, and politicians. It seems reasonable to conclude that some analysis and comparisons would be made regarding spending by individual PACs and the effect - real or assumed - that the spending had on the race, politician, policy, or issue targeted by the PAC in question.

> 12.4.2 *Explain the process through which the Constitution can be amended.* (2001, p. 165)

This particular state content standard as it relates to *Principles of American Democracy* must, if addressed by teachers of the course, deal with the concepts of majority and super-majority. These concepts are, of course, statistical in nature, and should lead to important questions such as: *Why do some kinds of voting and amending require a majority or "simple majority", while other kinds of voting and amending require a 2/3 majority or "supermajority"?* To truly understand such questions requires a comprehensive understanding of the mathematical difference between two distinctly different types of statistical majorities.

> 12.6.3 *Evaluate the roles of polls, campaign advertising, and the controversies over campaign funding.* (2001, p. 166)

All three of the concepts included within this content standard address concepts and skills of social mathematics. In order to *evaluate* the roles of polls, campaign advertising, and the controversies over campaign funding, students must ask the fundamental question of whether polls, campaign advertising, and campaign funding work in the way in which they were designed to. In order to answer this question effectively, students would need to examine, analyze, evaluate, and judge mathematical and statistical evidence based on several questions: *Do poll results influence voting trends? Does money spent on campaign advertising affect a candidate's chances of winning an election?* These questions are but two questions one would reasonably assume would be asked and answered in the fulfillment of this content standard.

> 12.6.4 *Describe the means that citizens use to participate in the political process (e.g., voting, campaigning, lobbying, filing a legal challenge, demonstrating, and petitioning, picketing, running for political office).* (2001, p. 166)

It is reasonable to expect that the issue of the importance of voting would be revisited through the fulfillment of this standard. As described in the paragraph that follows content standard 12.2.4, it is assumed that the California Board of Education believed that some discussion would take place among the students enrolled in *Principles of American Democracy* about the importance of voting. It is reasonable to expect that this discussion would include references to recent close elections and the mathematical concepts behind "one person, one vote" and the "winner take all" Electoral College system of electing the President of the United States.

> 12.6.5 *Discuss the features of direct democracy in numerous states (e.g., the process of referendums, recall elections).* (2001, p. 166)

One feature of a direct democracy is that it changes the mathematical formula by which we elect officials and make policy. Instead of a "winner take all system" (a mathematical concept in which the winner of a majority of electors wins all the electoral votes of a district or state), direct democracy entails the mathematical concept of a simple majority. In a direct democracy, one more than half (or in the case of some referendums, one vote over a specified amount that may not necessarily be half) is needed to elect a representative or affect policy. This seemingly subtle mathematical difference has significant personal, legal, political, social, and economic implications that would likely be discussed as part of the fulfillment of this particular content standard.

> 12.6.6 *Analyze trends in voter turnout; the causes and effects of reapportionment and redistricting, with special attention to spatial districting and the rights of minorities; and the function of the Electoral College.* (2001. p. 166)

The topics addressed in standard 12.6.6 require knowledge of, and practice in, the concepts and skills of social mathematics. To analyze trends in voter turnout would require mathematical and statistical analysis of more obvious data such as income and education level of voters to an analysis of the impact of seemingly insignificant data such as the weather on election day, how long polls remained open, and where polls were located. To analyze the cause and effects of reapportionment and redistricting requires statistical comparisons between the voting trends of populations that lived in a specified geographic area before redistricting and reapportionment, and the voting trends of populations that lived in the same area after district lines were redrawn.

> 12.7.2 *Identify the major responsibilities and sources of revenue for state and local governments.* (2001, p. 167)

Content standard 12.7.2 asks students to work with revenue, budgets, and the allocation of financial resources. It is reasonable to assume that the California Board of Education expected that students would be given some example of a local, state, or federal budget to peruse in partial fulfillment of this particular content standard. It is also reasonable to assume that the California Board of Education expected that some

Table 5.7

The 51 California Social Studies Content Standards For *Principles of American Democracy,* Referenced By Category

Category 1	Category 2	Category 3	Category 4
12.1.1, 12.1.2, 12.1.3, 12.1.4, 12.1.5, 12.1.6	12.2.2, 12.2.4	12.3.2	
	12.4.2	12.4.1	
12.2.1, 12.2.3, 12.2.5, 12.2.6	12.6.4, 12.6.5	12.6.3, 12.6.6	
	12.9.8	12.7.2	
12.3.1, 12.3.3, 12.3.4			
12.4.3, 12.4.4, 12.4.5, 12.4.6			
12.5.1, 12.5.2, 12.5.3, 12.5.4			
12.6.1, 12.6.2			
12.7.1, 12.7.3, 12.7.5, 12.7.6, 12.7.7, 12.7.8			
12.8.1, 12.8.2, 12.8.3			
12.9.1, 12.9.2, 12.9.3, 12.9.4, 12.9.5, 12.9.6, 12.9.7, 12.9.8,			
40 total (78.4%)	**6 total (11.7%)**	**5 total (9.8%)**	**0 total (0%)**

classroom discussion would take place that would encompass topics and issues that go beyond mere *identification* of the responsibilities and sources of revenue for state and local governments. Some questions a social studies teacher might be expected to ask of her students might include: *How does a municipality or a state "borrow" money? Why doesn't our city allocate more money for schools or parks? Why can't the state just raise taxes?* Intelligent discussion of these and other questions require a fair amount of instruction in the concepts and skills of social mathematics.

> 12.9.8 *Identify the successes of relatively new democracies in Africa, Asia, and Latin America and the ideas, leaders, and general societal conditions that have launched and sustained, or failed to sustain, them.* (2001, p. 168)

In standard 12.9.8, it is clear that the California Department of Education wants teachers and students to go beyond identifying comparatively new democratic forms of government around the globe, but to discuss the political, social, and economic conditions that gave rise to these fledgling democracies. It seems reasonable to expect that, in examining the question of which societal condition(s) launched or sustained a developing democracy, some comparisons would need to be drawn in either a before and after scenario or through a comparison of countries similar in many respects but for their forms of government. In other words, it is reasonable to expect that in satisfying standards 12.9.8, California's social studies teachers would initiate two similar kinds of comparisons. The first would compare the societal conditions both before and after a country's recent adoption of democratic reforms. The second would likely be to compare the societal conditions of a recently established democracy to the societal conditions of a similar country that has either yet to enact democratic reforms, or a similar country that enacted democratic reforms decades ago. In these comparisons, teachers and students would need to rely on numeric information to make statistical comparisons. Comparing literacy rates, gross national product, trade deficits, budget deficits, economic aid, and potentially hundreds of other quantified forms of social and economic information are commonly relied upon as indicators of a country's economic, and therefore often political and societal, stability.

Conclusions Pertinent to the California Standards

An analysis of California's state content standards for social studies (*Principles of American Democracy*), reveals that in not one of the content standards is to be found the words *social mathematics*, *mathematics*, *statistics*, or *quantitative literacy*. No California social studies standard, as it applies to *Principles of American Democracy,* is identified as a category 4 standard in Table 5.7. A total of 40alifornia standards (approximately 78% were further categorized as not directly or indirectly addressing the concepts and skills of social mathematics (Category 1). It is unreasonable to expect that, in fulfilling the majority of California's social studies content standards as they apply to *Principles of Democracy*, teachers of the social studies would interpret any of these standards to include directives to teach the concepts and skills of social mathematics. It is equally unreasonable to expect or conclude that the California State Board of Education intended teachers of the social studies to interpret these 40 standards in any way as a mandate to teach the concepts and skills of social mathematics. These 40 standards reflect the kinds of traditional subjects that most parents, teachers, and students likely associate with civics, topics such as how a bill becomes a law, the "checks and balances" of the United States Government, and the Bill of Rights.

While it is true that the majority of the social studies content standards of the State of California do not directly or indirectly address the concepts and skills of social mathematics, the authors and consumers of the standards could interpret 11 of the 51 (approximately 21%) content standards as including the concepts and skills of social mathematics. Table 5.7 identifies all of the California social studies standards as they apply to *Principles of American Democracy* by four distinct categories. Recall that category 1 includes all state standards that do not directly or indirectly address the concepts and skills of social mathematics. Category 2 includes those content standards that, while possibly addressing concepts of skills of social mathematics indirectly, are not likely to be interpreted as doing so by the authors and consumers of the standards in question. Category 3 includes those content standards that are likely to be interpreted by the authors and consumers of the standards in question as addressing the concepts and skills of social mathematics. Category 4 includes those content standards that directly address the concepts and skills of social mathematics through clear and unambiguous language. The respective percentages in each category appear at the bottom of the appropriate column.

Clearly, those California social studies standards that do not directly or indirectly address the concepts and skills of social mathematics make up the largest single category (approximately 78%). The next largest of the categories of content standards is Category 2, which represents those standards that, while possibly addressing concepts and skills of social mathematics indirectly, are not likely to be interpreted as doing so by social studies teachers (approximately 12%). This suggests that the majority (nearly 90%) of the California social studies content standards written for *Principles of American Democracy* either do not directly or indirectly include concepts and skills of social mathematics or that they are not likely to be interpreted in this way by the authors and consumers of these standards. Five standards remain (approximately 10%), all categorized as Category 3 standards. As previously stated, none of the 51 California state social studies content standards, as they apply to *Principles of American Government,* directly address the concepts and skills of social mathematics. Since this is the case, it would prove an exercise in pure speculation to apply the social mathematics rubric (see Table 3.3) to those standards that are identified as Category 3 standards. Since Category 3 standards reflect those standards in which it is *likely* (as opposed to certain as in the case of category 4 standards) that the authors and consumers of the standards would interpret them as addressing the concepts and skills of social mathematics, the application of the social mathematics rubric to these Category 3 standards would be almost entirely arbitrary.

California, similar to the state of Texas, does include within the *History-Social Science Framework* sections devoted to describing the skills of the social studies. The skills are labeled "Participation Skills, Critical Thinking Skills, and Study Skills" (2001, pp. 24-6). The descriptions included under the general category of critical thinking skills include language that initially appears to include social mathematics. Students in California are expected, through satisfying the state social studies standards, to learn to define and clarify problems, judge information related to a problem, and solve problems and draw conclusions (2001). Very little of the descriptions accompanying these skills makes use of language that remotely resembles social mathematics. Two skills enumerated under the general skill heading of *solve problems and draw conclusions* come as close as any to social mathematics. Students are to be able to "…decide whether the information provided is sufficient in quality and quantity to justify a conclusion" (2001, p. 26) and be able "…to test conclusions or hypotheses, and to predict probable consequences" (2001, p. 26). While both descriptions of these two skills allude to the concepts and skills of social mathematics, neither description directly addresses the role that social mathematics can play in civics education.

Content Standards For Social Studies (*Political Science*), State Of Florida

Unlike the states of Texas and California, the state of Florida does not publish specific content standards aligned with each course offered in the state's public schools. Florida's state content standards for social studies are instead divided into four general standards for grades 6-8 and 9-12 (1999, pp. 1-3):

1. Time, Continuity, and Change [History]
2. People, Places, and Environments [Geography]
3. Government and the Citizen [Civics and Government]
4. Economics

In the case of Florida, the fact that the state content standards are not course-specific as they are in Texas and California is mitigated by the inclusion of state content standards specifically designed for civics and government.

The case of Florida is a bit more difficult than Texas and California, in that the analysis provided for Chapter 3 identified two courses mandated by the state of Florida that contain substantial amounts of civic instruction. Texas and California offer a single course in grades six-twelve that includes substantial instruction in civics. In the case of Texas, that course is *United States Government* and in California, that course is *Principles of American Democracy*. Yet Florida offers *Political Science* as two different courses: one that is offered in grades six through eight, and the other in grades nine through twelve. Because of this, the following section will first examine Florida's state *Civics and Government* standards for grades six through eight, and then examine Florida's state *Civics and Government* standards for grades nine through twelve. Each set of grade-specific content standards will be treated separately, except in the case of Table 5.8, in which all content standards relevant to social mathematics will be listed along with the specific concepts and skills of social mathematics expected to be addressed through fulfillment of the content standard.

Florida's Civics and Government Standards for Grades 6 through 8

Florida's state content standards in *Civics and Government* for grades 6 through 8 and grades 9 through 12 flow from two general standards. For grades 6 through 8, those two standards are as follows (1999, pp. 2-3):

1. The student understands the structure, functions, and purposes of government and how the principles and values of American democracy are reflected in American constitutional government (SS.C.1.3).
2. The student understands the role of the citizen in American democracy (SS.C.2.3).

Similar to the content standards of other disciplines published by other states, Florida's two general *Civics and Government* standards are followed by standards that more fully address and elaborate upon the concepts to be learned by Florida's public school students. For *Political Science* (grades 6-8), the first general standard is followed by six standards, while the second general standard is followed by a total of seven standards.

Similar to the analysis conducted for the state content standards of Texas and California, the first step in the process of analysis of the Florida social studies standards was to review each standard to readily identify those that did not, in any direct or indirect manner, address any of the concepts and skills of social mathematics (category 1 standards). As is to be expected of an analysis of the social studies content standards of any state, this initial analysis revealed that there were a number of content standards that could be dismissed from further analysis because they do not directly or indirectly reflect the concepts or skills of social mathematics. In the case of the Florida content standards for *Political Science*, 11 of the standards (approximately 85%) were analyzed and identified as standards that did not directly or indirectly include the concepts and skills of social mathematics (Category 1 standards). So that the reader may better understand the types of standards that were identified for elimination from further consideration in this study, two of those 11 standards appear below to serve as examples (1999, pp. 2-3):

> 1.2 *understands major ideas about why government is necessary and the purposes government should serve.*

Standard 1.2 is so general in nature that it is easier to enumerate the myriad of ways that it can be satisfied without concepts or skills of social mathematics. Of course it is possible, if one is of the persuasion to do so, to incorporate a number of social mathematical concepts and skills in examining the various purposes that government should serve. Like other non-examples provided in this chapter, however, it is difficult to imagine that many teachers of the social studies would choose to interpret this standard to include substantial instruction in, and practice with, social mathematics. The same holds true for standard 1.4 (1999, p. 3):

Table 5.8

Florida Content Standards For *Political Science (grades 6-12)* Identified As Potentially Addressing Social Mathematical Concepts (pp. 1-3)

Standard #	***Florida State Standard***	***Social Mathematical Concepts****
2.1, Grades 6-8	*Understands the history of the rights, liberties, and obligations of citizenship in the United States.*	Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Collecting and measuring data; Analyze conclusions drawn from data
2.7, Grades 6-8	*Understands current issues involving rights that affect local, national, or international political, social, and economic systems.*	Interpreting maps, charts, graphs, diagrams, timelines, etc., that depict mathematical or statistical data; Resource management and allocation; Understanding interest; Understanding proportion; Understanding ratio and rate
1.4, Grades 9-12	*Understands the role of special interest groups, political parties, the media, public opinion, and majority/minority conflicts on the development of public policy and the political process.*	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, and mode; Interpreting maps, charts, diagrams, timelines, etc., that depict mathematical or statistical data; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data; Understanding proportion

Table 5.8 (cont.)

Florida Content Standards For *Political Science (grades 6-12)* Identified As Potentially Addressing Social Mathematical Concepts

Standard #	***Florida State Standard***	***Corresponding Social Mathematical Concepts****
2.2, Grades 9-12	*Assess the role that his or her own political behavior plays in determining the flow of power through our political system and for resolving conflicts in a pluralistic society.*	Interpreting maps, charts, graphs, diagrams, timelines, etc., that depict mathematical or statistical data; Understanding proportion; Understanding ratio and rate; Sampling and margin of error; Dispersion; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data
2.7, Grades 9-12	*Knows the points at which citizens can monitor or influence the process of public policy formation*	Interpreting maps, charts, graphs, diagrams, timelines, etc., that depict mathematical or statistical data; Understanding proportion; Understanding ratio and rate; Sampling and margin of error; Dispersion; Average and central tendency; Collecting and measuring data; Statistical outliers in data; Analyze conclusions drawn from data

* This column represents the content and skills of mathematics that it is reasonable to expect would be addressed through a broad interpretation of the corresponding state standard. Note that, due to considerations of length, some of the concepts and skills of social mathematics are slightly abbreviated. In any case where a skill or concept was abbreviated, an effort was made to retain the scope and meaning of the original skill or concept as stated in Table 3.4: *Instruction and Practice in Social Mathematics*.

> <u>1.4:</u> *knows the major parts of the federal system including the national government, state governments, and other governmental units (e.g., District of Columbia, American tribal governments, and the Virgin Islands).*

Standard 1.4 presents an even less likely case than standard 1.2 for the inclusion of social mathematics. Even the most ardent supporter of the inclusion of mathematical and statistical study within citizenship education would likely have a difficult time rationalizing how standard 1.4 could be interpreted to include social mathematical concepts or skills.

Of Florida's thirteen content standards for *Civics and Government* (grades 6-8), two (slightly more than 15%) content standards would seem to indirectly or potentially address concepts and skills of social mathematics. The first is standard 2.1, which reads (1999, p. 3):

> <u>2.1</u> *Understands the history of the rights, liberties, and obligations of citizenship in the United States.*

It seems reasonable to assume that members of the Florida Board of Education expected that teachers and students would address issues like the importance of voting and the civic obligation of being informed about issues and current events. Recall the premise of John Allen Paulos's *A Mathematician Reads the Newspaper* (1995) is that it is impossible to be informed about current issues and events without understanding basic mathematical and statistical information. If one accepts Paulos's argument as true, then it seems reasonable to expect that if the concepts and skills of social mathematics were to be addressed through fulfilling any of Florida's state content standards for civics and government, it would come through fulfilling state standard 2.1.

Similarly, Florida's *Civics and Government* content standard 2.7 addresses the need for students of the social studies to be informed about current issues. It again seems reasonable to assume that members of Florida's Board of Education expected that instruction in the concepts and skills of social mathematics would occur through the satisfaction of state content standard 2.7 (1999, p. 3):

> 2.7 *Understands current issues involving rights that affect local, national, or international political, social, and economic systems.*

As John Allen Paulos pointed out in *Innumeracy* (1988) and *A Mathematician Reads the Newspaper* (1995), it is impossible to *understand* current issues if you do not understand some basic mathematics and statistics. The reason, Paulos argues, is that so much of the information and arguments presented in media outlets including newspapers is mathematical and statistical in nature. It is reasonable to expect that through the satisfactory completion of standard 2.7, teachers would need to provide some instruction and practice in the concepts and skills of social mathematics.

Florida's Civics and Government Standards for Grades 9 through 12

As previously stated, Florida offers *Political Science* in secondary schools, but the focus and intent of the course differs from the *Political Science* course offered in the middle grades (in the case of Florida, grades 6 through 8). The two general content standards listed under *Civics and Government* are exactly the same for grades 9 through 12 as they are for grades 6 through 8 (1999, p. 3):

1. The student understands the structure, functions, and purposes of government and how the principles and values of American democracy are reflected in American constitutional government (SS.C.1.4).

2. The student understands the role of the citizen in American democracy (SS.C.2.4).

Instead of 13 standards like those found in the state content standards for grades 6 through 8, there are a total of 11 standards for grades 9 through 12. Standard 1 is further defined through the inclusion of 4 sub-standards, while standard 2 includes 7. Much like the state content standards for *Civics and Government* for grades 6 through 8, the majority (eight of the eleven standards, or just over 72%) of content standards for grades 9 through 12 do not directly or indirectly address concepts or skills of social mathematics. Take, for example, standard 1.3 (1999, p. 2):

> 1.3 *Understands how the overall design and specific features of the Constitution prevent the abuse of power by aggregating power at the national, state, and local levels; dispersing power among different levels of government; and using a system of checks and balances (e.g., federalism).*

Much like the other examples used within this chapter to illustrate examples of state content standards that do not explicitly nor implicitly address basic tents of social mathematics, standard 1.3 makes no direct or indirect mention of mathematical or statistical concepts or skills.

There are, however, three content standards (just over 27% of Florida's state standards for *Civics and Government* for grades 9-12) that, while not explicitly addressing issues of social mathematics, do represent the type of content standard that would be completely satisfied only with the inclusion of basic social mathematics. For example, standard 1.4 requires that each Florida student (1999, p. 3):

> 1.4 *Understands the role of special interest groups, political parties, the media, public opinion, and majority/minority conflicts on the development of public policy and the political process.*

In order to satisfy Florida standard 1.4, it seems reasonable to expect that Florida's social studies teachers would need to discuss if and how special interest groups, political parties, the media, and public opinion influence politics and policy. It is difficult to conceive of meaningful discussions of these subjects without the inclusion of money and poll results and the influence they bring to bear on the political process. Of course, money and polls in and of themselves are not necessarily harbingers of instruction in, or practice with, concepts and skills of social mathematics. Yet it seems reasonable to expect that Florida's social studies teachers – or their students – would ask the critical question of how much, if any, influence polls and money have on the outcome of elections or formation of public policy. In order to address this question, it would be necessary to delve into the realm of mathematics and statistics to develop intelligent comparative analyses in an attempt to answer such questions.

The two remaining standards identified as indirectly or potentially addressing social mathematical concepts and skills (standards 2.2 and 2.7) are similar to state standard 1.4 in the sense it seems reasonable to expect that through complete satisfaction of standards 2.2 and 2.7 would come instruction and practice in some of the concepts and skills of social mathematics (1999, p. 3):

> <u>2.2</u> *Assess the role that his or her own political behavior plays in determining the flow of power through our political system and for resolving conflicts in a pluralistic society.*
>
> <u>2.7</u> *Knows the points at which citizens can monitor or influence the process of public policy formation*

Both of these content standards do not implicitly speak of mathematics and statistics. Yet it seems reasonable to conclude that some amount of social mathematics

Table 5.9

The 13 Florida Social Studies Content Standards For *Political Science* (grades 6-8), Referenced By Category

Category 1	Category 2	Category 3	Category 4
1.1, 1.2, 1.3, 1.4, 1.5, 1.6 2.2, 2.3, 2.4, 2.5, 2.6 **11 total (84.6%)**	2.1, 2.7 **2 total (15.3%)**	**0 total (0%)**	**0 total (0%)**

The 11 Florida Social Studies Content Standards For *Political Science* (grades 9-12), Referenced By Category

Category 1	Category 2	Category 3	Category 4
1.1, 1.2, 1.3 2.1, 2.3, 2.4, 2.5, 2.6 **8 total (72.7%)**	1.4 2.2, 2.7 **3 total (27.2%)**	**0 total (0%)**	**0 total (0%)**

would be inherent in intelligent and meaningful instruction and discussion of many of the topics included within each standard. For example, standard 2.2 asks Florida's school students to assess the role that their own political behavior has on power. Whether one is speaking of money, voting, signing a petition, campaigning, or protesting, numbers and statistics likely play a part in assessing the effectiveness of such actions. It seems reasonable to assume that Florida's Board of Education expects that secondary social studies teachers would ask their students to bring some amount of mathematical or statistical analysis to bear on their own assessments of their political behavior. *How do they know that the petition that they signed to ban a waste incinerator had any effect? What was the effect and why did it succeed or fail?* The answers to questions like these require the use of concepts and skills of social mathematics.

Conclusions Pertinent to the State of Florida

An analysis of Florida's state content standards for social studies (*Political Science*, specifically) reveals a pattern similar to the one found in the analysis of California's state social studies content standards. Neither state puts an overt or explicit premium of instruction in, or study of, social mathematical concepts and skills. Not one of the social studies content standards for *Political Science* makes specific mention of the words *social mathematics*, *mathematics*, *statistics*, or *quantitative literacy*. It would seem that Florida's Board of Education harbors little commitment to the inclusion of social mathematics within their content standards.

This is not to suggest, however, that the state of Florida completely ignores social mathematics. It is reasonable to expect that, given that social studies content standards 2.2 and 2.7 (grades 6-8) and standards 1.4, 2.2, and 2.7 (grades 9-12) are category 2 standards, there is some implied level of commitment on the part of the state of Florida for instruction in the concepts and skills of social mathematics. Recall that category 2 standards are those standards that, while possibly addressing concepts of skills of social mathematics indirectly, are not likely to be interpreted as doing so by the authors and consumers of the standard in question. Stated another way, it is possible that the state of Florida indirectly supports instruction in social mathematics, but it is equally possible that the authors and consumers of those state standards will likely fail to interpret any of the standards as explicitly or implicitly addressing the concepts and skills social mathematics.

Final Conclusions

There are several conclusions to draw based upon the preceding analyses of the social studies content standards of Texas, California, and Florida as they apply to their respective courses earlier identified as addressing civic content and skills. First, some conclusions are in order in regard to the three individual states. This section is followed by some comparative analysis of the content standards of all three states to help further develop a deeper understanding of how social mathematics is reflected in state standards.

It is clear that the Texas Education Agency publishes more specific social studies content standards for *United States Government* than the state of California provides for *Principles of Democracy* or Florida's Board of Education publishes for *Political Science*. This can be interpreted in several ways, the least flattering (at least as far as Texas social studies teachers are concerned) of these interpretations is that the state of Texas does not trust the professional judgment of teachers of *United States Government*. The standards mandate and prescribe nearly every topic to be covered, with comparatively little flexibility given to classroom teachers to expand upon concepts or help to deepen their students' understanding of important skills and concepts. Another way to interpret the

Texas social studies content standards is that they may represent minimum content benchmarks that the Texas Education Agency expects teachers to address. In other words, the Texas Education Agency may require that the 23 core standards and 81 additional standards of *United States Government* be addressed first, and then expect social studies teachers to elaborate upon them further. It is possible that the Texas Education Agency expects social studies teachers to provide their students with a minimum prescribed amount of instruction and practice in the concepts and skills of social mathematics through satisfying state standards B.21.E, B.21.F, and B.22.C and also expects that social studies teachers will more fully elaborate upon these and all of the other state standards over the course of a semester or year.

What of the social studies content standards published by the states of California and Florida? These state standards, unlike the social studies standards of the state of Texas, make no direct reference to *social mathematics*, *mathematics*, *statistics*, *quantitative literacy*, or any derivations of these words. It is not reasonable to conclude that, just because the state social studies content standards published by California and Florida do not contain direct references to social mathematics, that the California State Board of Education and the Florida State Board of Education do not support instruction and practice in social mathematics. There are two reasonable possibilities that support this conclusion. The first possibility is that both the California State Board of Education and the Florida State Board of Education support instruction in mathematics as it applies to social information and social problems or situations, they just support such instruction in disciplines other than civics (or perhaps more specifically, in courses other than *Principles of American Democracy* and *Political Science*). The second possibility is that both the California State Board of Education and the Florida State Board of Education publish relatively few content standards (compared to the number of content standards published by the Texas Education Agency) because both boards want to give their teachers maximum flexibility in addressing the large amount of content and the many skills of social studies. It remains unclear, however, how, where, or even if the commitment of the states of California and Florida to instruction in social mathematics manifests itself other than within theses states' social studies content standards.

How do the three conjectures offered in the previous chapter fit into the analysis conducted as part of this chapter? The first of these conjectures (all three conjectures developed in the previous chapter are re-worded here to reflect state-level analysis), that the state education agencies of California, Texas, and Florida fail to recognize the significance of social mathematics as it relates to civics education, seems even less substantiated after reviewing the content standards published by these state agencies. The strongest evidence to refute this conjecture is the fact that the state of Texas includes standards that directly address the concepts and skills of social mathematics. Although neither the state of California nor that state of Florida publish civic standards that directly address the concepts and skills of social mathematics, both states publish content standards identified as category 2 standards, and in the case of California, content standards identified as category 2 and category 3 standards. These results suggest that the conjecture that the states of California, Texas, and Florida simply do not recognize the significance of social mathematics as it applies to civics has little factual support.

The second conjecture offered in the previous chapter concerned the issue of whether the state boards of education of California, Texas, and Florida conceptualize social mathematics as a skill of the social studies and as such do not explicitly reflect the concepts and skills of social mathematics in their content standards. There is evidence to support this conjecture. Recall that the three Texas standards to qualify as Category 4 standards (signifying that they directly address the concepts and skills of social mathematics) were all labeled as *social studies skills* by the Texas Education Agency. Additionally, many of the state standards of California, Texas, and Florida identified as Category 2 or Category 3 standards direct students to *analyze, evaluate,* and *compare*; action verbs that suggest skills rather than content. Similar to the conclusions drawn regarding the standards published by the National Council for the Social Studies and the Center for Civic Education, it is reasonable to conclude that if the states of California, Texas, and Florida conceptualize social mathematics as a skill of citizenship, this may explain why the concepts and skills of social mathematics are not enumerated under the content of the three courses identified for analysis in this study. Additionally, recall that Texas (the only state to directly address the concepts and skills of social mathematics within the state standards) includes their 3 Category 4 standards under *skills of the social studies*.

The third conjecture developed as a result of the analysis of national standards is that social mathematics is recognized by the state boards of education of California, Texas, and Florida as a skill of social studies, but these state organizations feel that it is the responsibility of a discipline other than civics to instruct in and further develop this skill. In the case of Florida, this conjecture is neither demonstrably supported nor refuted by the evidence collected during the analysis of the state content standards. In this chapter, I demonstrated that the state of California does recognize and clarify social studies skills in a section removed from the content standards, but I further demonstrated that the majority of these skills did not directly or indirectly address the concepts and skills of social mathematics.

The analysis undertaken for this chapter has led to a fourth conjecture not evident in the analysis conducted in the previous chapter. This conjecture developed from a simple question: *Why is the Texas Education Agency the only state of the three considered for this study to publish content standards and a listing of social studies skills that directly address the concepts and skills of social mathematics?* One could speculate, as was done in an earlier paragraph, that the Texas Education Agency feels compelled to directly mandate instruction in the concept and skills of social mathematics and that the states of California and Florida simply do not feel as compelled to do so. There is another possible explanation for the reason that the Texas Education Agency includes language addressing mathematical concepts and skills in the social studies.

Recall that the *Texas Essential Knowledge and Skills* (2003) includes within the content standards of social studies a sub-heading entitled s*ocial studies skills.* The skills outlined within these content standards contain specific skills of mathematics and statistics. For example, recall the following Texas social studies content standard, listed under s*ocial studies skills* (2003, p. C-37):

> <u>B.21.F</u> *Use appropriate mathematical skills to interpret social studies information such as maps and graphs.*

All of the content standards of the individual disciplines of the social studies offered to students in grades 5 through 12 contain content standards included under the category of *social studies skills*. For every course of the social studies, these content standards labeled as *social studies skills* reflect some amount of direct instruction in or practice with mathematics and statistics. This fuels speculation over what the role of No Child Left Behind legislation plays in the social studies content standards of Texas. The No Child Left Behind Education Act of January 8, 2002 specified new, and for some, more rigorous academic standards for every academic discipline. The portion of the legislation that seems to be drawing the most attention from politicians, educators, teachers, and parents, however, is the portion that specifies new "high stakes" testing of student competency in some, but currently not all, of these disciplines. These federally mandated tests are labeled "high stakes" because, for the first time, district funding is directly tied to the test results. Those school districts that perform poorly on the tests will receive less federal funding, while those school districts that increase student test scores will receive increases in federal funding.

What is of significance to this analysis is that No Child Left Behind legislation currently mandates state testing only in the areas of language arts and mathematics. It is conceivable, given the amount of pressure that No Child Left Behind Legislation (and perhaps more importantly, testing) brings to bear on individual school districts, which state boards of education may feel compelled to move towards revising their state standards in every discipline to reflect the increased need to support mathematics instruction. Stated another way, states may indeed feel the need to revise their standards to include more instruction and practice in mathematics in every content area. Students would be taught mathematics in mathematics class, but it would not only be within mathematics class that students would be provided opportunities to apply what they have learned. Students may be given the opportunity to apply mathematics to science, art, music, gym, language arts, and social studies.

The fact that the analyses conducted as part of this chapter reveal that only the Texas Education Agency directly mandates instruction in the concepts and skills of social mathematics within all of the social studies courses offered in grades 6 through 12 does not diminish the evidence that supports this conclusion. The Texas Education Agency's *Texas Essential Knowledge And Skills* was published on September 8, 2003, exactly one year and eight months after the passage of No Child Left Behind. The most recent versions of the California and Florida social studies content standards are October 11, 2000 – (updated in 2001) and January, 1999, respectively. It is intriguing to speculate that Texas revised their state standards to reflect NCLB legislation, and that the states of California and Florida (and others) have yet to revise their standards in a similar fashion. It is also intriguing to speculate that Texas may have already had some form of state legislation in place similar to the current federal NCLB legislation, given that current President George Walker Bush was previously governor of the state of Texas. The state of Texas may have a comparatively longer history in publishing content standards that reflect an emphasis on mathematics and the sciences.

It is also instructive to apply this conjecture to the national standards published by the National Council for the Social Studies and the Center for Civics in Education. Both sets of national standards were published several years before the passage of No Child Left Behind, and this may serve to partially explain why neither set of standards directly support instruction in the concepts and skills of social mathematics. Perhaps NCLB legislation will place some real or perceived pressure upon the NCSS and the Center for

Civic Education to be more inclusive of those mathematical and statistical skills that can inform the disciplines of the social studies and civics. The NCSS may feel less compelled to bow to NCLB pressures considering that the NCSS already embraces mathematics as evident in their clarification of the social studies.

> …the integrated study of the social sciences and the humanities to promote civic competence. Within the school program, social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. (1994, p. vii)

In addition to embracing the role that mathematics can play in the social studies, recall that the NCSS task force believes that:

> …powerful social studies teaching integrates across the curriculum. It provides opportunities for students to read and study text materials, appreciate art and literature, communicate orally and in writing, observe and take measurements, develop and display data, and in various other ways to conduct inquiry and synthesize findings using knowledge and skills taught in all school subjects. (1994, p. 165)

While the National Council for the Social Studies may indeed embrace mathematics and mathematical study as part of the social studies, the NCSS standards were clearly offered as a guideline, not a mandate, for states and school districts to follow when developing their own standards. This stands in stark contrast to the implicit message of the federal No Child Left Behind legislation. Though the NCLB act did not mandate federal or state content standards, it did de facto determine what would be emphasized and taught in many classrooms, schools, districts, and states.

Given this, it seems reasonable to conclude that No Child Left Behind legislation has prompted many school districts to include more mathematics and language arts in every discipline area throughout the school day. As these districts look to their respective state boards of education for support in meeting the requirements of the NCLB act, it is not surprising that one of the state's responses would be to mandate more mathematical and language arts instruction and practice in every discipline, including the social studies. This may serve to explain why the social studies content standards of Texas are the only standards among the three states considered for this study to directly address a significant amount of the content and skills of social mathematics.

The three conjectures offered at the end of the previous chapter and at the end of this chapter – along with this new conjecture – will be applied as part of the analysis in the following chapter. Will the examples of social mathematics to be found in *Magruder's American Government* lend support for any of the four conjectures, or will the examples support other conclusions regarding how the curricula of civics represents the calls for social mathematics?

Chapter 6

An Analysis of the Treatment of Social Mathematics In ***Magruder's American Government***

This chapter presents a detailed description of the treatment of social mathematics in *Magruder's American Government***.** Evidence provided in chapter 3 supported the conclusion that *Magruder's American Government* represented a unique opportunity to discern the level of commitment on the part of textbook publishers to include instruction and activities in social mathematics within civics texts. This conclusion is further supported by the fact that *Magruder's American Government* is widely believed among industry analysts to have maintained at least seventy percent of the civics textbook market since it was first marketed to school districts in 1917 (Walker, 2002). Clearly, *Magruder's American Government* is a civics text that enjoys wide distribution throughout American schools.

There are several questions that will be considered in this chapter. Does *Magruder's American Government* address the calls for the inclusion of social mathematics in the civics curricula? How does *Magruder's American Government* address these calls? What is the quality of the treatment of social mathematics in *Magruder's*? What aspects of social mathematics does Magruder's neglect? How well does *Magruder's* address those standards – identified in the previous chapter as addressing social mathematics – adopted by the states of California, Texas, and Florida? Finally, how well does *Magruder's* address national standards published by the National Council for the Social Studies and the Center for Civic Education? These questions guided the analyses conducted in this chapter and provided the framework for reporting the results throughout the following pages.

The decision to consider *Magruder's* as largely representative of the civics textbooks currently on the market is supported by the fact that all three states included within this study – California, Texas, and Florida – use *Magruder's American Government* in *Principles of American Democracy* (California), *United States Government* (Texas), and *Political Science* (Florida). There is additional support to identify *Magruder's American Government* as central to this analysis because California, Texas, and Florida are among the top five textbook adoption states in the United States (Jones 2000). As a result of the combined public secondary school populations of these three states, *more than 7 million students use Magruder's American Government in these states alone.*

If Prentice Hall (a division of Pearson Education), publisher of *Magruder's American Government*, sells this text to the state boards of education of California, Texas, and Florida, Prentice Hall must address every content standard published by these agencies. In other words, the state social studies content standards of California (*Principles of American Democracy*), Texas (*United States Government*), and Florida (*Political Science*) that include social mathematical concepts and skills identified in the previous chapter of this dissertation must be addressed in *Magruder's American Government*. One of the critical questions for this study is how *Magruder's American Government* treats the social mathematical components of the social studies content standards of California, Texas, and Florida. How do the editors of *Magruder's American Government* interpret these state social studies content standards that include social mathematical concepts and skills, and how do these interpretations manifest themselves in the text, activities, and assessments?

How the Analysis of Magruder's American Government Was Conducted

The most recent edition (2004) of Magruder's American Government was purchased through Prentice Hall. This 844-page text was read four times. Each reading was a comprehensive examination of the entire text and took a period of between two and three weeks. At every point in the text (including passages, sidebars, end of chapter activities, sections on assessment, etc.) in which numbers (save for numbers assigned to pages, chapters, and questions), statistical information (represented by text or by numbers), mathematical or statistical operations, or any example of the concepts or skills of social mathematics appeared within the text, a notation of this occurrence was made on a chart developed for this purpose. I repeated this process during the second, third, and fourth readings of the text. I added any new occurrences as a result of these subsequent readings of numbers, statistical information, mathematical or statistical operations, or any example of the concepts or skills of social mathematics to the aforementioned chart. In addition, at any point in the text where I found numbers, statistical information, mathematical or statistical operations, or any other similar occurrence, but not immediately discernable as an example of social mathematics, that occurrence was noted in a separate column. This column was labeled *questionable incidences of social mathematics.*

Once *Magruder's American Government* was thoroughly vetted for all possible occurrences of social mathematics, the results were analyzed on three separate occasions. I did this to ensure that every occurrence of numbers, statistical information, mathematical or statistical operations, or any example of the concepts or skills of social mathematics that appeared within the text were appropriately categorized as either an example of social mathematics or as a questionable example of social mathematics. This second step provided an opportunity for a more detailed analysis of those items that appeared in the column labeled *questionable incidences of social mathematics*. As a result, I eliminated some of these examples from further consideration while I ultimately included others as examples of social mathematics to be found in *Magruder's American Government* (see Tables 6.1 and 6.2).

Does Magruder's Address the Calls For The Inclusion Of Social Mathematics in the Civics Curricula?

Similar to the analyses conducted in chapters 4 and 5, it is prudent to first demonstrate ways in which *Magruder's American Government* does not address the concepts and skills of social mathematics. It seems obvious to suggest that the vast majority of the *Magruder's* text does not reflect social mathematics, so examples of sentences, activities, and passages are not provided here. What is of more value is to provide some examples of the ways in which numbers, numerical information, or words and phrases that suggest concepts and skills of social mathematics are employed throughout the text but do not qualify as social mathematics. For this purpose, two examples from the aforementioned *questionable incidents of social mathematics* column that I ultimately eliminated from further consideration in this study are included below. These examples are included within this chapter to provide evidence as to why a passage, segment, activity, or assessment that contains numbers or numerical information may not actually be an example of instruction or practice in the concepts or skills of social mathematics:

Example #: 1
Location: Page 31
Title, Chapter, or identifying characteristic: The Thirteen Colonies, 1775 (Interpreting Maps)
Description: This "Interpreting Maps" sidebar to the text on page 31 depicts the original 13 colonies. Prominently displayed in the map is a scale of miles.
Explanation for rejection: The question asked of students is: *How were royal colonies governed?* Distance between colonies or the size of the colonies could be addressed in answering the question, but no direct or indirect inferences are made regarding the role that the scale of miles could play in determining an answer to the question. Instead, the map is shaded in three colors, depicting the states as "royal colonies", "proprietary colonies", and "charter colonies".

Example #: 2
Location: Page 73
Title, Chapter, or identifying characteristic: Formal Amendment Process (Interpreting Diagrams)
Description: This "Interpreting Diagrams" sidebar to the text on page 73 illustrates the formal amendment process in two steps. Both steps employ fractions (2/3 and 3/4) and whole numbers.
Explanation for rejection: Students are not asked to do anything with the numbers presented in this sidebar. Instead, students are asked the following question: *How does the formal amendment process illustrate federalism?*

The two examples that appear above are typical of the other examples enumerated under the heading of *questionable incidents of social mathematics* that were eliminated from further consideration (Tables 6.1 and 6.2). These 12 examples represent 11.2% of the overall incidences (actual and possible examples) of social mathematics to be found in *Magruder's American Government*. The common theme among the segments initially identified as *questionable incidents of social mathematics* is that, in the vast majority of cases, these segments either included numeric information, or asked "analysis" and "inference" questions of data that seemed to indicate that some amount of social mathematical thinking would need

Table 6.1

Examples of Questionable Incidents of Social Mathematics Found In *Magruder's American Government* That Were Eliminated From Consideration

Page	Category[1]	Title[2]
31	Interpreting Maps	The Thirteen Colonies
73	Interpreting Diagrams	Formal Amendment Process
151	Skills For Life	Predicting Consequences
197	Interpreting Tables	Total Campaign Spending, 1960-2000
199	Interpreting Graphs	PAC Contributions to Congressional Candidates
212	Interpreting Graphs	Mass Media Use, 2005
219	Interpreting Charts	Effect of Poll Wording On Reliability
226	Interpreting Graphs	U.S. Radio Stations and Owners
263	Interpreting Maps	Representation In Congress
270	Interpreting Maps	Mississippi Congressional Districts, 1991 & 2004
432	Interpreting Tables	The Independent Regulatory Commissions
510	Interpreting Tables	The National Judiciary

[1] Categories identified by the editors of *Magruder's American Government*
[2] Actual Titles used in *Magruder's American Government*

to be employed on the part of the student to answer the question. Upon further analysis, however, these segments I ultimately rejected because although many of these examples do in fact contain information represented mathematically or statistically, no actual demands are made on the part of the students to use the information to make predictions, inferences, or to draw any conclusions (see Table 6.2). The numeric information, in essence, is employed a descriptor. No explanations are given as to how or why the numeric information serves as a substitute for text, the text does not ask students to do anything with the numeric information provided, and in many cases, there does not appear to be an overt way in which a social studies teacher could address the segment as an opportunity to teach concepts or skills of social mathematics.

There are a total of 95 (approximately 88.8% of the total documented incidences) additional incidences of numbers, statistical information, and mathematical or statistical operations that I identified as directly addressing the concepts and skills of social mathematics. These 95 examples of social mathematics in *Magruder's American Government* are listed in Table 6.3. After a thorough analysis, these 95 identified occurrences of social mathematics within *Magruder's American Government* represent 100% of all occurrences of social mathematics within the text. From this point forward, these 95 total identified occurrences form the basis for analysis and comparison, and it will be assumed that these 95 occurrences represent 100% of all incidents of social mathematics to be found in *Magruder's American Government*.

Table 6.2

Explanations For Why The Researcher Eliminated From Consideration Questionable Incidents of Social Mathematics Identified in Table 6.1

Page	Explanation
31	Scale in miles included, but no attempt is made to correlate the scale to the question posed of students: *How were royal colonies governed?*
73	Numeric information (including fractions) included in the chart, but no attempt is made to correlate the numeric information to the question posed of students: *How does the formal amendment process illustrate federalism?*
151	*Skills for Life* section on predicting the consequences of allowing voting to take place on the Internet. No discussion of the role that statistics play in making predictions.
197	Significant amounts of data are provided in this example including year, estimated spending, voter turnout, and spending per voter. The statement under the table reads: *Total campaign spending has risen dramatically in recent elections. What factors may account for this rise?* While this appears to ask students to reason from data that is provided, the question does not require students to make use of the data. In fact, students could answer the question without the information provided in the table. The statement that comes directly before the question provides all the information they need: *Total campaign spending has risen dramatically in recent elections*. The "factors" alluded to in the question are not related to the information in the graph. Compare this to a question that might have asked students to use the graph to answer the following: *Has total campaign spending affected voter turnout? In what ways?*
199	Similar to example on page 197. Statement under graph reads: *Political Action Committees (PACs) have become a major source of campaign money. How do you think the growth of PACs has affected political campaigns since the 1980s?* The students do not need the numeric information in the graph. The graph simply reinforces the statement that *Political Action Committees (PACs) have become a major source of campaign money.*
212	Similar to examples on pages 197 and 199. Statement under graph reads: *This graph shows the hours that Americans spend each year on various forms of media. Why do Americans spend more time watching television than other forms of media?* As in previous examples, the student only needs the statement to answer the question, not the numeric representations in the graph. The information in the graph supports the statement that *Americans spend more time watching television than other forms of media.* The answers to the question posed cannot be found in, or extrapolated from, the data provided in the graph.

Table 6.2 (cont.)

Explanations For Why The Researcher Eliminated From Consideration Questionable Incidents of Social Mathematics Identified in Table 6.1

Page	Explanation
219	Depicts three different ways to phrase a poll question. Curiously, underneath each question is a percentile representation of those who “agree” and “disagree” with the poll statement. The question posed to students is: *Which question is worded in the least biased manner? How do you know?* It is unclear as to what purpose the inclusion of fictitious results serves.
226	Similar to examples on pages 197, 199, and 212. Graph depicts number of stations and owners of U.S. radio stations. Statement under graph reads: *While the number of radio stations has increased fairly steadily for years, the number of radio station owners has dropped significantly. How might this trend affect the quality and/or type of local programming?* Once again, students would only need to read the statement to answer the question. The numerical data depicted in the chart is superfluous. Students are not asked to make connections between the data and the question posed.
263	Numeric information provided in this map includes populations, number of senators, and number of house members of Wyoming and California. Question asks: *How does the distribution of Senate seats among the states illustrate the principle of federalism?* Students do not need to make use of the data presented in the map to answer the question.
270	Mississippi’s congressional districts of 1991 and 2004 are compared in this map. Students do not need to make use of the limited numeric data provided to answer the question posed: *Why does the redrawing of district lines regularly produce sharp political conflicts in a state?* This question would have social mathematical implications if other pieces of information were included on the map regarding ethnic and racial makeup of districts, median income, education levels, party affiliation, voting habits, etc.
432	Numeric information provided regarding the independent regulatory agencies depicted in this table. Information includes date established, number of members, and term of members of each regulatory commission. Question posed to students: *How do the functions listed above show that these commissions have legislative and judicial powers?*
510	Table largely consists of numeric data of the national judiciary including the year each court was created, the number of courts per circuit, the number of judges serving the circuit, and the term of judges on each circuit. The question posed to students: *Why do you think some judgeships are for life and others are only for 15 years?*

How Magruder's Addresses Social Mathematics

The 95 identified incidences of social mathematics in *Magruder's American Government* are distributed among 9 categories within the text: *Interpreting Tables*, *Interpreting Maps*, *Interpreting Timelines*, *Interpreting Graphs*, *Interpreting Charts*, *Interpreting Diagrams*, *Assessment* questions or activities, *Skills for Life*, or *Embedded in Text* (see Tables 6.4 through 6.12). The first eight of these categories are exact titles of segments to be found in *Magruder's American Government*. In other words, the text contains "sidebars" entitled *Interpreting Tables* or *Skills For Life*, which often depict numeric or statistical information. Recall that, in order for a segment to be included as one of the 95 identified occurrences of social mathematics within *Magruder's American Government*, that segment must ask students (directly or indirectly) to interpret or apply the information to a question or activity posed. The ninth category, *Embedded in Text*, is a category created to identify social mathematical concepts that appear within the "regular" text that flows through *Magruder's*.

Table 6.4 depicts the social mathematics found within the *Interpreting Tables* sections of the text. There are 15 identified examples of social mathematics within the *Interpreting Tables* sections of *Magruder's.* The examples enumerated in this category represent 15.7% of all occurrences of social mathematics within the text. All 15 identified examples are apart from the "regular" text. That is to say that every example of social mathematics included in the *Interpreting Tables* section are part of a detached "sidebar" that is separate from the text.

Table 6.3

Examples of Social Mathematics In *Magruder's American Government*, Listed In Order Of Appearance

Page	Category[1]	Identifying Description[1]
52	Interpreting Tables	Slavery in the United States, 1790
57	Interpreting Tables	Ratification of the Constitution
76	Interpreting Tables	Amendments to the Constitution
100	Interpreting Maps	Territorial Expansion of the United States
128-29	Interpreting Timelines	Four Eras of Political Parties
134	Interpreting Graphs	The 1912 Presidential Election
135	Interpreting Tables	Significant Minor Parties In Presidential Elections, 1980-2000
142	Interpreting Graphs	Political Party Identification, 1960-2000
145	Assessment	Time Line Activity
154	Embedded In Text	18-20 year olds response to the 26th amendment
155	Interpreting Graphs	Political Participation and Awareness In America
162	Interpreting Graphs	Southern Black Voters, 1960-1970
164	Embedded In Text	Size of the non-voter problem in the United States
165	Interpreting Tables	Voter Turnout, 1958-2002
167	Interpreting Tables	Voting By Groups In Presidential Elections 1968-2000
168	Interpreting Graphs	Voter Turnout In Selected Democracies
169-70	Embedded In Text	Sociological factors for low voter turnout
172	Assessment	Critical Thinking: Predicting Consequences
175	Assessment	Critical Thinking: Identifying Critical Issues
175	Assessment	Participation Activities: It's Your Turn
184	Interpreting Graphs	Voter Turnout In Statewide Primaries
218-21	Embedded In Text	Scientific polling and the polling process
222	Skills For Life	Taking A Poll
225	Interpreting Graphs	Americans With Internet Access
227	Interpreting Tables	Access To Media, Selected Countries
230	Assessment	Demonstrating a Reasoned Judgment

[1] All Category and Identifying Description titles are used *in Magruder's American Government* except for "embedded in text", a category titled and described by the author.

Table 6.3 (cont.)

Examples of Social Mathematics In *Magruder's American Government*, Listed In Order Of Appearance

Page	Category	Identifying Description
244	Interpreting Graphs	Membership In Labor Unions
251	Interpreting Graphs	Growth of PACs
257	Assessment	It's Your Turn: Conducting A Poll
264	Interpreting Tables	Comparative Government and Legislative Bodies
265	Assessment	Making Comparisons
266	Skills For Life	Analyzing Maps
267-68	Embedded In Text	Reapportionment
268	Interpreting Maps	Congressional Apportionment, 2003-2013
269	Interpreting Timelines	Gains and Losses in Off Year Elections
273	Assessment	Predicting Consequences
278	Assessment	Drawing Inferences
280	Interpreting Graphs	Profile of the 108th Congress
287	Assessment	Critical Thinking Skills
287	Assessment	Graphing Activity
295	Interpreting Graphs	Federal Spending of Tax Dollars, 1984-2004
300	Interpreting Graphs	Rise In Bankruptcies, 1992-2003
304	Interpreting Maps	Federal Land In the Western United States
325	Interpreting Graphs	Party Strength (At Beginning of Term)
326	Interpreting Maps	Representation By State, 108th Congress
331	Interpreting Tables	House Committee Chairs, 2004
332	Interpreting Tables	Senate Committee Chairs, 2004
344	Interpreting Charts	The Number of Bills That Become Law
349	Assessment	Graphing Activity
367	Interpreting Maps	Election of 1800
369	Interpreting Maps	National Convention Sites
379-81	Embedded In Text	Flaws in the Electoral College
381	Interpreting Tables	Popular Vote vs. Electoral Vote
382-84	Embedded In Text	Proposed reforms to the Electoral College
384	Assessment	Identifying Alternatives
384	Assessment	Expressing Problems Clearly
387	Assessment	Chart Activity
398	Skills For Life	Using Time Lines
406	Interpreting Tables	Presidential Vetoes, 1933-2003

Table 6.3 (cont.)

Examples of Social Mathematics In *Magruder's American Government*, Listed In Order Of Appearance

Page	Category	Identifying Description
436	Skills For Life	Gathering Information From Government Sources
439	Interpreting Charts	Profile of Civil Service Employees
443	Assessment	Graphing Activity
448	Interpreting Tables	The Federal Government's Income (In Billions of Dollars)
449	Interpreting Diagrams	Progressive Income Tax
453	Skills For Life	Paying Your Taxes
456	Interpreting Graphs	Government Borrowing, 1940-2003
460	Interpreting Tables	Federal Spending (In Billions of Dollars)
465	Assessment	Applying the Chapter Skill
465	Assessment	Graphing Activity
473	Interpreting Graphs	The Changing Face of the United States Army
485	Interpreting Graphs	Military Spending, Selected Countries
497	Interpreting Graphs	UNICEF Expenditures by Priority
513	Interpreting Maps	U.S. Federal Court Districts and Circuits
587	Interpreting Graphs	Use of Capital Punishment Worldwide
588	Interpreting Graphs	Executions in the Unites States, 1976-2003
591	Assessment	It's Your Turn
595	Interpreting Charts	Ethnic Composition of the United States
598	Interpreting Graphs	Median Weekly Earnings of Men and Women
600	Skills For Life	Reading Tables and Analyzing Statistics
609	Interpreting Graphs	Men and Women in the Workforce, Selected Countries
616	Interpreting Graphs	Legal Immigrants to the United States, 1829-2000
621	Assessment	Applying the Chapter Skill
621	Assessment	Graphing Activity
665	Skills For Life	Interpreting Line Graphs
669	Interpreting Graphs	Per Capita GDP in Selected Countries
670	Interpreting Graphs	Unemployment in Selected Countries, 1993-2003
679	Assessment	Applying the Chapter Skill
679	Assessment	Graphing Activity
697	Interpreting Maps	Party Control of Governorships, 2004
708	Interpreting Graphs	The Juvenile Court Caseload, 1960-2000
710	Interpreting Tables	Crime Rates of Selected Countries
732	Assessment	Determining Cause and Effect
734	Interpreting Graphs	State and Local Spending
741	Interpreting Graphs	State and Local Revenue
744	Assessment	Identifying Alternatives

Two segments from the *Interpreting Tables* sections appear below to serve as examples of why I selected them as harboring concepts or skills of social mathematics:

Example #1: Page 331, House Committee Chairs, 2004
Description: This table has 5 columns, entitled committee, name, age, year elected to House, party affiliation, and state. The question posed to students is: W*hat do their ages, years in the house, and party affiliation tell you about the post each of these members holds?*
Reason for Inclusion: The question asks students to not only interpret the information presented in the table, but to draw conclusions based upon the information. In addition, students would need to employ the basic mathematical operation of subtraction to determine the number of years each member has served in the House.

Example #2: Page 167, Voting By Groups In Presidential Elections, 1968-2000
Description: Comprehensive table that depicts the percentage of voters of different sex, race, educational level, age, religion, politics, and geographical region who voted in the 1968-2000 Presidential elections. The following appears under the table: *Some groups of voters have favored one or the other party over time. In this table, which group most clearly demonstrates that point?*
Reason for Inclusion: The question asks students to interpret, analyze, and draw conclusions from the data provided. In order to answer the question, students would need to engage in multiple layers of analysis, from determining trends among the seven different groups to correlating that information with both the Presidential elections and the percentage of group votes won by the Republican, Democratic, and third party candidates in every election.

Table 6.5 depicts the social mathematics found within the *Interpreting Maps* sections of the text. There are 8 identified examples of social mathematics within the *Interpreting Maps* sections of *Magruder's.* The examples enumerated in this category represent 8.4% of all occurrences of social mathematics within the text. All 8 identified examples are apart from the "regular" text. That is to say that every example of social mathematics included in the *Interpreting Maps* sections are part of a detached "sidebar" that is separate from the text.

Two segments from the *Interpreting Maps* sections appear below to serve as examples of why they were selected as harboring concepts or skills of social mathematics:

Example #1: Page 268, Congressional Apportionment, 2003-2013
Description: This map of the United States includes two small charts listing the states that gained or lost representation in Congress after the 2000 census. The question posed to students is: *What general trend in population growth around the country does this map show?*

Table 6.4

Examples of Social Mathematics In *Interpreting Tables*

Page	Category	Identifying Description
52	Interpreting Tables	Slavery in the United States, 1790
57	Interpreting Tables	Ratification of the Constitution
76	Interpreting Tables	Amendments to the Constitution
135	Interpreting Tables	Significant Minor Parties In Presidential Elections, 1980-2000
165	Interpreting Tables	Voter Turnout, 1958-2002
167	Interpreting Tables	Voting By Groups In Presidential Elections 1968-2000
227	Interpreting Tables	Access To Media, Selected Countries
264	Interpreting Tables	Comparative Government and Legislative Bodies
331	Interpreting Tables	House Committee Chairs, 2004
332	Interpreting Tables	Senate Committee Chairs, 2004
381	Interpreting Tables	Popular Vote vs. Electoral Vote
406	Interpreting Tables	Presidential Vetoes, 1933-2003
448	Interpreting Tables	The Federal Government's Income (In Billions of Dollars)
460	Interpreting Tables	Federal Spending (In Billions of Dollars)
710	Interpreting Tables	Crime Rates of Selected Countries

Total: 15 examples, 15.7% of examples of social mathematics to be found in *Magruder's American Government*

Reason for Inclusion: The question asks students to interpret the information presented in the map, but also to understand that the number of representatives a state sends to Congress is in direct relation to the state's population. Students must not only be able to interpret the information, but to reason a conclusion based upon the information provided.

Example #2: Page 367, Election of 1800

Description: Simple map of the states that comprised the United States in 1800. States (or portions of states) are colored in red and blue to denote which party (Democratic-Republican or Federalist) garnered the most electoral support by region. The question posed to students: *How does this map show the political divisions in the country in 1800?*

Reason for Inclusion: In order to answer the question, students would need to interpret the map as well as the numeric and statistical information provided. A small table within the map provides the reader with the number of electoral votes each of the five major candidates running for President in 1800 was awarded. In addition, a pie chart represents the percentage of electoral votes each of the two major political parties won in the election of 1800. There is a geographic, mathematical, and statistical component to the answer to the question posed of students.

Table 6.6 depicts the social mathematics found within the *Interpreting Timelines* sections of the text. There are 2 identified examples of social mathematics within the *Interpreting Timelines* sections of *Magruder's.* The examples enumerated in this category represent 2.1% of all occurrences of social mathematics within the text. Both identified examples are apart from the "regular" text. That is to say that both examples of social mathematics included in the *Interpreting Timelines* sections are part of a detached "sidebar" that is separate from the text.

The two segments from the *Interpreting Timelines* sections appear below to serve as examples of why they were selected as harboring concepts or skills of social mathematics.

Example #1: Pages 128-29, Four Eras of Political Parties

Description: This timeline depicts the era of Democrats (1800-1860), the era of Republicans (1860-1932), the era of Democrats (1932-1968) and the era of Divided Government (1968 – on). The question posed to students is: S*ince 1980, which party has controlled the Presidency for the longest period of time?*

Reason for Inclusion: The question asks students to not only interpret the information presented in the map, but also to perform some mathematical computations to determine the answer.

Example #2: Page 269, Gains and Losses in Off Year Elections

<u>Description:</u> Timeline that depicts off year elections from 1972-2002 and the number of Democratic and Republican seats in Congress won or lost as a result of the election. The question posed to students: *In which two election years above did the President's party lose the most seats in the house?*

<u>Reason for Inclusion:</u> In order to answer the question, students would need to interpret the timeline and correctly correlate the President and the President's party with the gains and losses in Congress in that same year. Students would also need to interpret the numeric data provided, and to perform some basic arithmetical calculations to determine the answer to the question.

Table 6.7 depicts the social mathematics found within the *Interpreting Graphs* sections of the text. There are 27 identified examples of social mathematics within the *Interpreting Graphs* sections of *Magruder's*. The examples enumerated in

Table 6.5

Examples of Social Mathematics In *Interpreting Maps*

Page	Category	Identifying Description
100	Interpreting Maps	Territorial Expansion of the United States
268	Interpreting Maps	Congressional Apportionment, 2003-2013
304	Interpreting Maps	Federal Land In the Western United States
326	Interpreting Maps	Representation By State, 108th Congress
367	Interpreting Maps	Election of 1800
369	Interpreting Maps	National Convention Sites
513	Interpreting Maps	U.S. Federal Court Districts and Circuits
697	Interpreting Maps	Party Control of Governorships, 2004

Total: 8 examples, 8.4% of examples of social mathematics to be found in *Magruder's American Government*

this category represent 28.4% of all occurrences of social mathematics within the text. All 27 identified examples are apart from the "regular" text. That is to say that all 27 examples of social mathematics included in the *Interpreting Graphs* sections are part of a detached "sidebar" that is separate from the text.

Table 6.6

Examples of Social Mathematics In *Interpreting Timelines*

Page	Category	Identifying Description
128-29	Interpreting Timelines	Four Eras of Political Parties
269	Interpreting Timelines	Gains and Losses in Off Year Elections

Total: 2 examples, 2.1% of examples of social mathematics to be found in *Magruder's American Government*

Two segments from the *Interpreting Graphs* sections appear below to serve as examples of why they were selected as harboring concepts or skills of social mathematics:

Example #1: Page 134, The 1912 Presidential Election

Description: This graph depicts the Presidential election results of 1912. The top five candidates are included, along with the number of popular and electoral votes received, as well as the percentage of the popular vote each candidate won. The questions posed to students: *Which party came in "second"? Even though the Bull Moose Progressives were a minor party, how did they help determine which major party won the election?*

Reason for Inclusion: The question asks students to interpret the information presented in the graph, but to perform some mathematical computations to determine the answer. Students would need to recognize the mathematical and statistical implications that the number of popular and electoral votes Theodore Roosevelt and William H. Taft received had upon the outcome of the election.

Example #2: Page 280, Profile of the 108th Congress

Description: Complex graph that profiles the membership of the 108th Congress in several forms. A table includes the top 5 occupations of Congressional representatives, 6 different pie graphs depict the ages, gender, and racial and ethnic background of Congressional representatives, and a pictograph depicts the party affiliations by color. The question posed to students: *How does racial and ethnic diversity differ between the House and the Senate?*

Reason for Inclusion: In order to answer the question, students would need to interpret the pie graphs that depict the racial and ethnic backgrounds of members of the House and Senate. Students would need to compare statistics and draw some conclusions based upon the statistical information provided.

Table 6.7

Examples of Social Mathematics In *Interpreting Graphs*

Page	Category	Identifying Description
134	Interpreting Graphs	The 1912 Presidential Election
142	Interpreting Graphs	Political Party Identification, 1960-2000
155	Interpreting Graphs	Political Participation and Awareness In America
162	Interpreting Graphs	Southern Black Voters, 1960-1970
168	Interpreting Graphs	Voter Turnout In Selected Democracies
184	Interpreting Graphs	Voter Turnout In Statewide Primaries
225	Interpreting Graphs	Americans With Internet Access
244	Interpreting Graphs	Membership In Labor Unions
251	Interpreting Graphs	Growth of PACs
280	Interpreting Graphs	Profile of the 108^{th} Congress
295	Interpreting Graphs	Federal Spending of Tax Dollars, 1984-2004
300	Interpreting Graphs	Rise In Bankruptcies, 1992-2003
325	Interpreting Graphs	Party Strength (At Beginning of Term)
456	Interpreting Graphs	Government Borrowing, 1940-2003
473	Interpreting Graphs	The Changing Face of the United States Army
485	Interpreting Graphs	Military Spending, Selected Countries
497	Interpreting Graphs	UNICEF Expenditures by Priority
587	Interpreting Graphs	Use of Capital Punishment Worldwide
588	Interpreting Graphs	Executions in the Unites States, 1976-2003
598	Interpreting Graphs	Median Weekly Earnings of Men and Women
609	Interpreting Graphs	Men and Women in the Workforce, Selected Countries
616	Interpreting Graphs	Legal Immigrants to the United States, 1829-2000
669	Interpreting Graphs	Per Capita GDP in Selected Countries
670	Interpreting Graphs	Unemployment in Selected Countries, 1993-2003
708	Interpreting Graphs	The Juvenile Court Caseload, 1960-2000
734	Interpreting Graphs	State and Local Spending
741	Interpreting Graphs	State and Local Revenue

Total: 27 examples, 28.4% of examples of social mathematics to be found in *Magruder's American Government*

Table 6.8 depicts the social mathematics found within the *Assessment* sections of the text. There are 25 identified examples of social mathematics within the *Assessment* sections of *Magruder's.* The examples enumerated in this category represent 26.3% of

Table 6.8

Examples of Social Mathematics In *Assessment*

Page	Category	Identifying Description
145	Assessment	Time Line Activity
172	Assessment	Critical Thinking: Predicting Consequences
175	Assessment	Critical Thinking: Identifying Critical Issues
175	Assessment	Participation Activities: It's Your Turn
230	Assessment	Demonstrating a Reasoned Judgment
257	Assessment	It's Your Turn: Conducting A Poll
265	Assessment	Making Comparisons
273	Assessment	Predicting Consequences
278	Assessment	Drawing Inferences
287	Assessment	Critical Thinking Skills
287	Assessment	Graphing Activity
349	Assessment	Graphing Activity
384	Assessment	Identifying Alternatives
384	Assessment	Expressing Problems Clearly
387	Assessment	Chart Activity
443	Assessment	Graphing Activity
465	Assessment	Applying the Chapter Skill
465	Assessment	Graphing Activity
591	Assessment	It's Your Turn
621	Assessment	Applying the Chapter Skill
621	Assessment	Graphing Activity
679	Assessment	Applying the Chapter Skill
679	Assessment	Graphing Activity
732	Assessment	Determining Cause and Effect
744	Assessment	Identifying Alternatives

Total: 25 examples, 26.3% of examples of social mathematics to be found in *Magruder's American Government*

all occurrences of social mathematics within the text. All 25 identified examples appear within the *Assessment* sections at either the end of each chapter or the end of each unit.

Two segments from the *Assessment* sections appear below to serve as examples of why they were selected as harboring concepts or skills of social mathematics:

Example #1: Page 621, Applying the Chapter Skill
Question: Study the data on page 595 that shows the ethnic composition of the United States and answer the following questions. *(A) In which years did the percentage of African Americans reach its lowest point? (B) What was the African American*

population of the United States in that year? (C) Based on this table, what can you conclude about the Native American population in the United States in 1850? (D) Based on your reading of this chapter, what does your answer to (C) tell you about data from the 1850 census?

Reason for Inclusion: This assessment question asks students to make a series of interpretations of data concerning the ethnic composition of the United States during the period of 1790-2000. Students are also asked to draw conclusions regarding the "larger question" of data included (or perhaps more accurately, not included) in the 1850 census.

Example #2: Page 744, Identifying Alternatives

Question: *What might be the advantages and disadvantages of raising revenue through (A) a State-run lottery (B) a State-run business? (C) a statewide property tax?*

Reason for Inclusion: A student cannot answer this assessment question without examining the pros and cons of each revenue plan – pros and cons that would, by necessity, include economic and financial aspects. These economic and financial differences would need to be quantified and compared in order to effectively address the advantages and disadvantages of each revenue plan.Table 6.9 depicts the social mathematics found embedded within the text of *Magruder's American Government*. There are 7 identified examples of social mathematics embedded within the text of

Table 6.9

Examples of Social Mathematics In *Embedded in Text*

Page	Category	Identifying Description
154	Embedded In Text	18-20 year olds response to the 26th amendment
164	Embedded In Text	Size of the non-voter problem in the United States
169-70	Embedded In Text	Sociological factors for low voter turnout
218-21	Embedded In Text	Scientific polling and the polling process
267-68	Embedded In Text	Reapportionment
379-81	Embedded In Text	Flaws in the Electoral College
382-84	Embedded In Text	Proposed reforms to the Electoral College

Total: 7 examples, 7.3% of examples of social mathematics to be found in *Magruder's American Government*

Table 6.10

Examples of Social Mathematics In *Skills for Life*

Page	Category	Identifying Description
222	Skills For Life	Taking A Poll
266	Skills For Life	Analyzing Maps
398	Skills For Life	Using Time Lines
436	Skills For Life	Gathering Information From Government Sources
453	Skills For Life	Paying Your Taxes
600	Skills For Life	Reading Tables and Analyzing Statistics
665	Skills For Life	Interpreting Line Graphs

Total: 7 examples, 7.3% of examples of social mathematics to be found in *Magruder's American Government*

Magruder's. The examples enumerated in this category represent 7.3% of all occurrences of social mathematics within the text. For space considerations, the shortest segment of social mathematics embedded within the Magruder's text is included as the first example. The second example is a synopsis of a much lengthier segment of text.

Example #1: Responses of 18-20 year olds to the 26th amendment
Location: Page 154
Description: This segment is embedded within a larger segment of voting age requirements of the United States Constitution. The entire passage appears below:

> *How have 18-to-20-year-olds responded to the 26th Amendment? In 1972, 58 percent of that age group registered to vote, and 48.4 percent of them reported that they did vote that year. By 2000, however, the registration figure had dropped to 40.5 percent, and only 28.4 percent said they actually went to the polls. Contrast the turnout of these people with that of Americans 65 and older: In 2000, 76.1 percent of them were registered, and 67.6 percent voted. Indications are that low-turnout behavior of 18-to-20-year-olds continued in 2002.*

Reason for Inclusion: Even if the question of how 18-to-20-year-olds responded to the 26th amendment is purely rhetorical, the question is posed to students reading the text. How *has* this age group responded? The paragraph presents some compelling statistics, but it is still up to the reader to apply some social mathematical concepts and skills to answer the question.

Example #2: The Polling Process

<u>Location:</u> Pages 218-221

<u>Description:</u> This expansive section concerning the polling process delves substantially into the concepts and skills of social mathematics. The section begins with a history of scientific polling, examines the five basic steps of scientific polling (define the universe to be surveyed, construct a sample, prepare valid questions, select and control how the poll will be taken, and analyze and report findings to the public), defines basic terms (sample, random sample, quota sample), and discusses the role that sampling, probability, reliability, and validity play in poll results.

<u>Reason for Inclusion:</u> This particular selection introduces students of the social studies to the mathematical and statistical nature of scientific polling. Many of the concepts of social mathematics as they relate to polling are included, as well as fairly concise descriptions of the skills of applying the mathematical law of probability and random sampling.

Table 6.10 depicts the social mathematics found within the *Skills for Life* sections of the text. There are 7 identified examples of social mathematics within the *Skills for Life* sections of *Magruder's.* The examples enumerated in this category represent 7.3% of all occurrences of social mathematics within the text. All 7 identified

Table 6.11

Examples of Social Mathematics In *Interpreting Charts*

Page	Category	Identifying Description
344	Interpreting Charts	The Number of Bills That Become Law
439	Interpreting Charts	Profile of Civil Service Employees
595	Interpreting Charts	Ethnic Composition of the United States

Total: 3 examples, 3.2% of examples of social mathematics to be found in *Magruder's American Government*

examples are apart from the "regular" text. These Skills for Life sections, and therefore these 7 identified incidents of social mathematics to be found in *Magruder's,* appear as the last page of some of the chapters in the text.

Because the *Skills for Life* sections are at least a page in length, the two selections that appear below are a synopsis of the information and activities included on the page:

<u>Example #1:</u> Page 266, Analyzing Maps

Description: This *Skills for Life* page introduces social studies students to the cartogram, which is a map used to present statistics in a geographic format. In this case, the cartogram is of the population of the 13 colonies.

Reason for Inclusion: Students are instructed how to analyze a map and draw conclusions from it. Several questions are asked of students regarding the statistical information represented in the cartogram. In order to answer these questions, students would need to compare and analyze the numeric and statistical information, as well as to draw some conclusions concerning Congressional representation, population, and apportionment.

Example #2: Page 600

Description: A quick instruction in reading tables, identifying relationships among data, and drawing conclusion. A table entitled "Number of U.S. Households, by Ethnic Group: 1995-2010" is included.

Reason for Inclusion: This *Skills for Life* segment introduces students to a number of social mathematical concepts and skills as they apply to interpreting tables, numeric information, and drawing conclusions. Connections are drawn to skepticism over the reliability of sources of information, as well as to the need for mathematical and statistical literacy in our electronic age.

Table 6.11 depicts the social mathematics found within the *Interpreting Charts* sections of the text. There are 3 identified examples of social mathematics within the *Interpreting Charts* sections of *Magruder's.* The examples enumerated in this category represent 3.2% of all occurrences of social mathematics within the text. The 3 identified examples are apart from the "regular" text. That is to say that all 3 examples of social mathematics included in the *Interpreting Charts* sections are part of a detached "sidebar" that is separate from the text.

Two segments from the *Interpreting Charts* sections appear below to serve as examples of why they were selected as harboring concepts or skills of social mathematics:

Example #1: Page 344, The Number of Bills That Become Laws

Description: This chart uses a large funnel as a representation of the number of bills that are introduced versus the number of bills that are enacted into law. Numerical information includes the number of measures introduced, the number of measures reported by committee, the number of measures passed by one chamber, the number of measures passed by both chambers, and the number of measures passed into public law. The question posed to students: *After which step do most bills "die"?*

<u>Reason for Inclusion:</u> The question asked of students requires them to interpret the numeric information presented within the chart. This interpretation is not as straightforward as it might initially appear. Students are not asked how many bills passed one chamber, or how many bills committee reported. Students need to "work backwards" from the numeric information provided to answer the question, *after which step do most bills die?*

Table 6.12

Examples of Social Mathematics In *Interpreting Diagrams*

Page	Category	Identifying Description
449	Interpreting Diagrams	Progressive Income Tax

Total: 1 example, 1.1% of examples of social mathematics to be found in *Magruder's American Government*

<u>Example #2:</u> Page 595, Ethnic Composition of the United States

<u>Description:</u> Large chart depicting the ethnic composition of the United States in various decades since 1790. Population totals are provided in the form of whole numbers and as percentages of total population, a bar graph is included that depicts the rate at which 5 ethnic populations have grown since 1990, and 2 pie graphs depict ethnic populations for 6 classifications of ethnic groups, all depicted as a percentage of overall minority populations in 2000 and projected for 2050. Students are asked: *According to the data, which group will be the largest minority group in 2050?*

<u>Reason for Inclusion:</u> The question posed to students requires that they interpret some of the numeric information presented in the chart. Recall that this same graph is referred to in the *Applying the Chapter Skill* Assessment question on page 621 (see example #1, *Applying the Chapter Skill*, above).

Table 6.12 depicts the social mathematics found within the *Interpreting Diagrams* sections of the text. There is 1 identified example of social mathematics within the *Interpreting Diagrams* sections of *Magruder's.* The example in this category represents 1.1% of all occurrences of social mathematics

within the text. The identified example is apart from the "regular" text. That is to say that the example of social mathematics included in the *Interpreting Diagrams* sections is part of a detached "sidebar" that is separate from the text.

Since only 1 example of the inclusion of social mathematics was identified in all of the *Interpreting Diagrams* sections, this single example appears below:

Example #1: Page 449, Progressive Income Tax

Description: This diagram depicts the taxable rates of various incomes. A color-coded bar graph is included to represent this information. The segment beneath the diagram reads: *With a progressive income tax, the tax rate increases as total income increases. Today, federal income tax rates range from 10% to 35%. How much would this taxpayer owe with a taxable income of $37,500, which is exactly half the income on the example?*

Reason for Inclusion: The question that appears at the bottom of this diagram asks the student to perform several mathematical calculations to arrive at the answer. This example requires students to interpret a diagram, draw some conclusions from the diagram, and to perform some basic mathematical operations to answer the question correctly.

The Quality of the Treatment of Social Mathematics Within Magruder's

Now that the 95 identified incidences of social mathematics have been categorized and some explanation provided concerning how samples of each identified category addressed the concepts and skills of social mathematics, it is prudent to discuss the quality of these incidences. To determine the quality of each incidence of social mathematics within *Magruder's*, the social mathematics rubric developed in chapter 3 (see Table 3.3) was applied to each example. To determine the rubric score of an example of social mathematics, each passage, activity, problem, or question was analyzed to determine either what the book asked of students or what the book taught students. If a passage, activity, problem, or question instructed how or asked students to identify numeric data, it was scored as a 1. If a passage, activity, problem, or question instructed how or asked students to translate data into numeric and statistical formats or to translate numeric and statistical data into verbal or written formats, it was scored as a 2. If a passage, activity, problem, or question instructed how or asked students to manipulate and apply provided data in a context that was also provided by the authors and editors of *Magruder's*, it was scored as a 3. If a passage, activity, problem, or question instructed how or asked students to manipulate and apply data provided by the authors and editors of *Magruder's* in a similarly provided context, it was scored as a 4. If a passage, activity, problem, or question instructed how or asked students to collect and analyze data not provided by the authors and editors of *Magruder's* to draw conclusions or solutions to situations or problems provided by the authors and editors of *Magruder's*, it was scored as a 5. If a passage, activity, problem, or question instructed how or asked students to collect and analyze data not provided by the authors and editors of *Magruder's* to a situation or problem of the student's choosing, I scored it as a 6. These six levels of the social mathematics reflect a type of hierarchy of experience described by social studies educator H. Michael Hartoonian and historian Bernard Hollister (1989). As previously explained in chapter 3, it can be generally stated that a passage, question, or activity scored at a certain rubric level also reflects and addresses the social mathematical concepts and skills identified with those rubric levels that come before it. Thus, if a passage, question, or activity is scored a 3 from the social mathematics rubric, it can be generally assumed that the passage, question, or activity embraces the concepts and skills of social mathematics addressed in a score of 1 and 2.

The following 9 tables align all 95 incidences of social mathematics identified in *Magruder's American Government* with their corresponding rubric score. In addition, a

Table 6.13

Examples of Social Mathematics In *Interpreting Tables*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
52	Slavery in the United States, 1790	4	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Understanding ratio and rate, Understanding proportion
57	Ratification of the Constitution	3	Interpreting maps, charts, graphs, diagrams, timelines, etc
76	Amendments to the Constitution	3	Interpreting maps, charts, graphs, diagrams, timelines, etc
135	Significant Minor Parties In Presidential Elections, 1980-2000	4	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Understanding ratio and rate, Understanding proportion
165	Voter Turnout, 1958-2002	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.
167	Voting By Groups In Presidential Elections 1968-2000	3	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Understanding ratio and rate, Understanding proportion
227	Access To Media, Selected Countries	3	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Understanding ratio and rate, Understanding proportion
264	Comparative Government and Legislative Bodies	4	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Understanding ratio and rate, Understanding proportion
331	House Committee Chairs, 2004	4	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data
332	Senate Committee Chairs, 2004	4	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data
381	Popular Vote vs. Electoral Vote	4	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data
406	Presidential Vetoes, 1933-2003	4	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Understanding ratio and rate, Understanding proportion
448	The Federal Government's Income (In Billions of Dollars)	3	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Understanding ratio and rate, Understanding proportion
460	Federal Spending (In Billions of Dollars)	3	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Statistical outliers in data
710	Crime Rates of Selected Countries	3	Interpreting maps, charts, graphs, diagrams, timelines, etc., Drawing original conclusions from data, Statistical outliers in data

summary is provided that identifies those concepts and skills of social mathematics presented in chapter 3 (see Table 3.4) that are not addressed through the completion of the question, activity, project, or assessment in question. These results are depicted in Tables 6.13 through 6.21. I depict the results of Tables 6.13 through 6.21 provide evidence concerning which categories address which concepts and skills of social mathematics, as well as to what degree of quality each category addresses those concepts and skills.

Table 6.13 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 15 identified examples from *Interpreting Tables*. Table 6.13 reveals 5 distinct examples of social mathematics addressed in these identified examples from *Interpreting Tables*, or 31.3% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The average rubric score for the 15 examples from *Interpreting Tables* identified as addressing concepts and skills of social mathematics is 3.46. The concepts and skills of social mathematics the 15 examples did not address from *Interpreting Tables* were: probability and chance; sampling and margin of error; dispersion; mean, median, mode, average and central tendency; collecting and measuring data; communicating statistical conclusions to others; analyzing conclusions drawn from data; resource management and allocation; understanding interest; drawing original conclusions from data collected as part of an original poll, study, or project; and translating written, verbal, and other forms of information into numerical and statistical formats.

Table 6.14 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 8 identified examples from *Interpreting Maps*. Table 6.14 reveals 7 distinct examples of social mathematics addressed in these identified examples from *Interpreting Maps*, or 43.8% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The average rubric score for the 8 examples from *Interpreting Maps* identified as addressing

Table 6.14

Examples of Social Mathematics In *Interpreting Maps*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
100	Territorial Expansion of the United States	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Drawing original conclusions from data
268	Congressional Apportionment, 2003-2013	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion; Collecting and measuring data
304	Federal Land In the Western United States	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Drawing original conclusions from data
326	Representation By State, 108th Congress	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Statistical outliers in data
367	Election of 1800	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Dispersion; Statistical outliers in data; Understanding proportion
369	National Convention Sites	5	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Drawing original conclusions from data
513	U.S. Federal Court Districts and Circuits	5	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data
697	Party Control of Governorships, 2004	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Drawing original conclusions from data

concepts and skills of social mathematics is 3.88. The concepts and skills of social mathematics that the examples did not address in the 8 examples from *Interpreting Maps* were: probability and chance; sampling and margin of error; mean, median, mode, average and central tendency; communicating statistical conclusions to others; analyzing conclusions drawn from data: resource management and allocation; understanding interest; drawing original conclusions from data collected as part of an original poll, study, or project; and translating written, verbal, and other forms of information into numerical and statistical formats.

Table 6.15 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 2 identified examples from *Interpreting Timelines*. Table 6.15 reveals 1 distinct example of social mathematics addressed in the identified examples from *Interpreting Timelines*, or 6.3% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The average rubric score for the 2 examples from *Interpreting Timelines* identified as addressing concepts and skills of social mathematics is 2.0. The concepts and skills of social mathematics that were not addressed in the 2 examples from *Interpreting Timelines* were: probability and chance; sampling and margin of error; dispersion; mean, median, mode, average and central tendency; collecting and measuring data; communicating statistical conclusions to others; statistical outliers in data; analyzing conclusions drawn from data: resource management and allocation; understanding interest; understanding proportion; understanding ratio and rate; drawing original conclusions from data; drawing original conclusions from data collected as part of an original poll, study, or project; and translating written, verbal, and other forms of information into numerical and statistical formats.

Table 6.15

Examples of Social Mathematics In *Interpreting Timelines*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
128-29	Four Eras of Political Parties	1	Interpreting maps, charts, graphs, diagrams, timelines, etc.
269	Gains and Losses in Off Year Elections	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.

Table 6.16 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 27 identified examples from *Interpreting Graphs*. Table 6.16 reveals 5 distinct examples of social mathematics addressed in these identified examples from *Interpreting Graphs*, or 31.3% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The average rubric score for the 27 examples from *Interpreting Graphs* identified as addressing concepts and skills of social mathematics is 3.74. The concepts and skills of social mathematics the book did not address in the 27 examples from *Interpreting Graphs* were: probability and chance; sampling and margin of error; dispersion; mean, median, mode, average and central tendency; collecting and measuring data; communicating statistical conclusions to others; analyzing conclusions drawn from data; resource management and allocation; understanding interest; drawing original conclusions from data collected as part of an original poll, study, or project; and translating written, verbal, and other forms of information into numerical and statistical formats.

Table 6.16

Examples of Social Mathematics In *Interpreting Graphs*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
134	The 1912 Presidential Election	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
142	Political Party Identification, 1960-2000	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
155	Political Participation and Awareness In America	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
162	Southern Black Voters, 1960-1970	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Drawing original conclusions from data
168	Voter Turnout In Selected Democracies	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
184	Voter Turnout In Statewide Primaries	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
225	Americans With Internet Access	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
244	Membership In Labor Unions	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
251	Growth of PACs	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
280	Profile of the 108th Congress	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion; Statistical outliers in data
295	Federal Spending of Tax Dollars, 1984-2004	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion; Statistical outliers in data
300	Rise In Bankruptcies, 1992-2003	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
325	Party Strength (At Beginning of Term)	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
456	Government Borrowing, 1940-2003	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
473	The Changing Face of the United States Army	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
485	Military Spending, Selected Countries	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate

Table 6.16 (cont.)

Examples of Social Mathematics In *Interpreting Graphs*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
497	UNICEF Expenditures by Priority	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Understanding proportion
587	Use of Capital Punishment Worldwide	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Understanding proportion
588	Executions in the Unites States, 1976-2003	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion; Statistical outliers in data
598	Median Weekly Earnings of Men and Women	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
609	Men and Women in the Workforce, Selected Countries	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Understanding proportion
616	Legal Immigrants to the United States, 1829-2000	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Understanding proportion
669	Per Capita GDP in Selected Countries	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
670	Unemployment in Selected Countries, 1993-2003	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
708	The Juvenile Court Caseload, 1960-2000	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.
734	State and Local Spending	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion
741	State and Local Revenue	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Understanding ratio and rate; Drawing original conclusions from data; Understanding proportion

Table 6.17 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 25 identified examples from *Assessment*. Table 6.17 reveals 12 distinct examples of social mathematics addressed in these identified examples from *Assessment*, or 75% of the total number of concepts and

Table 6.17

Examples of Social Mathematics In *Assessment*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
145	Time Line Activity	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Drawing original conclusions from data
172	Critical Thinking: Predicting Consequences	5	Probability and chance; Collecting and measuring data; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Drawing original conclusions from data
175	Critical Thinking: Identifying Critical Issues	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Drawing original conclusions from data
175	Participation Activities: It's Your Turn	5	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Drawing original conclusions from data; Understanding proportion; Understanding ratio and rate
230	Demonstrating a Reasoned Judgment	5	Collecting and measuring data; Communicating statistical conclusions to others; Drawing original conclusions from data; Understanding proportion; Understanding ratio and rate
257	It's Your Turn: Conducting A Poll	5	Collecting and measuring data; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Drawing original conclusions from data
265	Making Comparisons	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Drawing original conclusions from data
273	Predicting Consequences	4	Communicating statistical conclusions to others; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data
278	Drawing Inferences	4	Communicating statistical conclusions to others; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data
287	Critical Thinking Skills	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Communicating statistical conclusions to others; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
287	Graphing Activity	4	Dispersion; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
349	Graphing Activity	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
384	Identifying Alternatives	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats

Table 6.17 (cont.)

Examples of Social Mathematics In *Assessment*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
384	Expressing Problems Clearly	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others;; Analyzing conclusions drawn from data; Understanding proportion; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
387	Chart Activity	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
443	Graphing Activity	5	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
465	Applying the Chapter Skill	1	Collecting and measuring data
465	Graphing Activity	5	Mean, median, mode, average tendency, and central tendency; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
591	It's Your Turn	5	Collecting and measuring data; Communicating statistical conclusions to others; Analyzing conclusions from data ; Drawing original conclusions from data
621	Applying the Chapter Skill	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
621	Graphing Activity	5	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
679	Applying the Chapter Skill	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.
679	Graphing Activity	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats
732	Determining Cause and Effect	5	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into num and stat formats
744	Identifying Alternatives	5	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Communicating statistical conclusions to others

Table 6.18

Examples of Social Mathematics In *Embedded in Text*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
154	18-20 year olds response to the 26th amendment	1	Analyzing conclusions drawn from data
164	Size of the non-voter problem in the United States	1	Analyzing conclusions drawn from data
169-70	Sociological factors for low voter turnout	1	Analyzing conclusions drawn from data
218-21	Scientific polling and the polling process	4	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average tendency, and central tendency; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Drawing original conclusions from data collected as part of an original poll, study, or project; Translating written, verbal, or other forms of information into numerical and statistical formats
267-68	Reapportionment	1	Understanding proportion
379-81	Flaws in the Electoral College	1	Dispersion; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Understanding proportion
382-84	Proposed reforms to the Electoral College	1	Communicating statistical conclusions to others; Analyzing conclusions drawn from data

skills of social mathematics as identified in Table 3.4. The average rubric score for the 25 examples from *Assessment* identified as addressing concepts and skills of social mathematics is 4.24. The concepts and skills of social mathematics that were not addressed in the 25 examples from *Assessment* were: probability and chance; sampling and margin of error; understanding interest; and drawing original conclusions from data collected as part of an original poll, study, or project.

Table 6.18 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 7 identified examples from *Embedded in Text*. Table 6.18 reveals 14 distinct examples of social mathematics

Table 6.19

Examples of Social Mathematics In *Skills for Life*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
222	Taking A Poll	6	Probability and chance, Sampling and margin of error; Dispersion; Mean, median, mode, average, and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Drawing original conclusions from data collected as part of an original poll, study, or project; Translating written, verbal, or other forms of information into numerical and statistical formats
266	Analyzing Maps	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Understanding proportion; Drawing original conclusions from data
398	Using Time Lines	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Drawing original conclusions from data
436	Gathering Information From Government Sources	1	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data
453	Paying Your Taxes	3	Collecting and measuring data; Understanding interest
600	Reading Tables and Analyzing Statistics	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Mean, median, mode, average, and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion
665	Interpreting Line Graphs	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Understanding proportion

addressed in these identified examples from *Embedded in Text*, or 87.5% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The average rubric score for the 7 examples from *Embedded in Text* identified as addressing concepts and skills of social mathematics is 1.43. The concepts and skills of social mathematics that were not addressed in the 7 examples from *Embedded in Text* were resource management and understanding interest. Table 6.19 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 7 identified examples from *Skills for Life*. Table 6.19 reveals 14 distinct examples of social mathematics addressed in these identified examples from *Skills for Life*, or 87.5% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The average rubric score for the 7 examples from *Skills for Life* identified as addressing concepts and skills of social mathematics is 3.71. The concepts and skills of social mathematics that were not addressed in the 7 examples from *Skills for Life* were: resource management and allocation and understanding ratio and rate.Table 6.20 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the 3 identified examples from *Interpreting Charts*. Table 6.20 reveals 6 distinct examples of social mathematics addressed in these identified examples from *Interpreting Charts*, or 37.5% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The average rubric score for the 3 examples from *Interpreting Charts* identified as addressing concepts and skills of social mathematics is 3.66. The concepts and skills of social mathematics that were not addressed in the three examples from *Interpreting Charts* were: probability and chance; sampling and margin of error; dispersion; mean, median, mode, average tendency, and central tendency; analyzing conclusions drawn from data; resource management and allocation; understanding interest; understanding proportion; drawing original conclusions from data collected as part of an original poll, study, or project; and translating written, verbal, or other forms of information into numerical and statistical formats.

Table 6.21 represents all of the examples of social mathematics addressed through fulfillment of the questions and exercises included in the identified example from *Interpreting Diagrams*. Table 6.21 reveals four distinct examples of social mathematics addressed in the identified example from *Interpreting Diagrams*, or 25% of the total number of concepts and skills of social mathematics as identified in Table 3.4. The rubric score for the example from *Interpreting Diagrams* identified as addressing concepts and skills of social mathematics is 3. The concepts and skills of social mathematics that the book does not address in the example from *Interpreting Diagrams* were: probability and chance; sampling and margin of error; dispersion; mean, median, mode, average tendency, and central tendency; communicating statistical conclusions to others; statistical outliers in date; analyzing conclusions drawn from data; resource management and allocation; understanding interest; drawing original conclusions from date; drawing original conclusions from data collected as part of an original poll, study, or project; and

Table 6.20

Examples of Social Mathematics In *Interpreting Charts*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
344	The Number of Bills That Become Law	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data
439	Profile of Civil Service Employees	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Drawing original conclusions from data
595	Ethnic Composition of the United States	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Drawing original conclusions from data; Understanding ratio and rate; Statistical outliers in data; Communicating statistical conclusions to others

translating written, verbal, or other forms of information into numerical and statistical formats.

It may initially appear, given the results of Tables 6.13 through 6.21, as if there is a substantive amount of social mathematical concepts and skills to be found in *Magruder's American Government*. A total of 95 identified occurrences of social mathematics within the text, large as the text is, would suggest that the concepts and skills of social mathematics are represented. The degree and quality of these representations, as well as which concepts and skills of social mathematics are neglected by certain categories are questions considered in the following analyses. In addition to

Table 6.21

Examples of Social Mathematics In *Interpreting Diagrams*

Page	Identifying Description	Rubric Level	Social Mathematics Addressed
449	Progressive Income Tax	3	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Understanding proportion; Understanding ratio and rate

the issue of the degree and quality of these representations, there are two remaining questions: Do these identified occurrences of social mathematics within *Magruder's American Government* satisfy the state social studies content standards of California, Texas, and Florida? In addition, do these identified occurrences of social mathematics within *Magruder's American Government* satisfy the national standards published by the National Council for the Social Studies and the Center for Civic Education when it comes to addressing the concepts and skills of social mathematics as they apply to civics?

An analysis of the categories of social mathematics identified in *Magruder's American Government* (see Table 6.22) suggests several results, the first of which concerns the placement of these identified categories within the text. The categories of *Interpreting Tables*, *Interpreting Maps*, *Interpreting Timelines*, *Interpreting Graphs*,

Table 6.22

Categories of Social Mathematics Identified In *Magruder's*

Category	1*	2	3 *	4*
Interpreting Tables	15.7%	3.46	31.3%	68.7%
Interpreting Maps	8.4%	3.88	43.8%	56.2%
Interpreting Timelines	2.1%	2.00	6.3%	93.7%
Interpreting Graphs	28.4%	3.74	31.3%	68.7%
Assessment	26.3%	4.24	75.0%	25.0%
Embedded In Text	7.3%	1.43	87.5%	12.5%
Skills For Life	7.3%	3.71	87.5%	12.5%
Interpreting Charts	3.2%	3.66	37.5%	62.5%
Interpreting Diagrams	1.1%	3.00	25.0%	75.0%

*Totals may not add up to 100% due to rounding.

Key:

Column 1 represents a % of the total number of categories that address the concepts and skills of social mathematics.

Column 2 represents the average rubric score (see Table 3.3) of all of the rubric scores assessed to all of the individual examples within that category.

Column 3 represents the % of the total number of concepts and skills of social mathematics (see Table 3.4) addressed by a particular category.

Column 4 represents a % of the total number of concepts and skills of social mathematics (see Table 3.4) not addressed by a particular category.

Skills for Life, *Interpreting Charts*, and *Interpreting Diagrams* are not embedded within the "regular text" of *Magruder's American Government*. These categories are literally "sidebars" related to the information presented in the regular text, but are positioned close to the outer margins of the text (in the case of *Interpreting Tables*, *Interpreting Maps*, *Interpreting Timelines*, *Interpreting Graphs*, *Interpreting Charts*, and *Interpreting Diagrams*) or at the end of a chapter or unit (in the case of *Skills for Life*).

Approximately 73.5 % of the identified occurrences of social mathematics are not embedded within the text. If the category of *Assessment* (technically not embedded in the general text) is added to the other categories not embedded in within the text (*Interpreting Tables*, *Interpreting Maps*, *Interpreting Timelines*, *Interpreting Graphs*, *Skills for Life*, *Interpreting Charts*, and *Interpreting Diagrams*), this figure increases to approximately 92.5%. This is to say that, at a minimum, approximately 73.5% of the identified occurrences of social mathematics come in the form of maps, charts, diagrams, and other "sidebar" forms of text. Conversely, if the category of *Assessment* is considered embedded in text, a maximum of approximately 33.6% of the identified occurrences of social mathematics are embedded within the overall text of *Magruder's American Government*.

In addition to identifying the percentage of occurrences of social mathematics among the nine categories, Table 6.22 also reports the average rubric score received by each category. I determined this score by averaging the total rubric scores received by all of the examples within each of the nine identified categories (see Tables 6.13 through 6.21). There are three ways to generalize these rubric scores. Rubric scores of 2 or below generally reflect passages, activities, problems, or questions that either require students to simply identify numeric data, or to identify numeric data and be able to translate that numeric information into a verbal or written format (and the ability to perform the converse – translate verbal or written information into a numeric or statistical format). Rubric scores of between approximately 3 and 4 generally reflect passages, activities, problems, or questions that directly or indirectly require students to perform the operations described in the preceding description, but also reflect a requirement that students manipulate and apply numeric data in a provided context and/or draw their own conclusions from data that is also provided. Rubric scores of between approximately 5 and 6 generally reflect passages, activities, problems, or questions that directly or indirectly require students to perform the operations described in the two preceding descriptions, but also reflect a requirement that students collect and analyze data not provided and apply the results of that analysis to a situation or problem that is provided and/or a requirement that students collect and analyze data not provided and apply the results of that analysis to a situation or problem that is of the student's choosing.

The goal of social mathematics instruction, similar to the goal of any instruction, is to teach a student to be able to do something (e.g., read, write, play an instrument). If we were to consider the abilities of a student working with the concepts and skills of social mathematics, one can conceptualize the general trend in rubric scores as an assessment of a student's progress in ability to work with those concepts and skills. Students would begin with the ability to identify and to "translate" numeric data, through collecting, manipulating and applying data, drawing conclusions, and analyzing those conclusions. One would award the highest rubric score in those situations in which a student is ultimately to able to envision and articulate a sort of problem solving process and to be able to use many if not all of the concepts and skills of social mathematics in that process to draw their own unique conclusions or solutions to the problem they identified.

What do the average rubric scores assessed to each category in Table 6.22 actually reflect? These average rubric scores per category reveal some interesting results concerning the quality of the presentation of the concepts and skills of social mathematics. The category determined to address the concepts and skills of social mathematics with the greatest quality is the category of *Assessment*. This would suggest that the editors of *Magruder's American Government* consider the assessment sections as important opportunities with which to test the ability of students to apply the concepts and skills of social mathematics. This result is supported by the evidence that the category of assessment directly addresses 12 of the 16, or 75%, of the concepts and skills of social mathematics identified in Table 3.4. This result is further supported by the evidence that the category of *Assessment* received an average rubric score of 4.24, .36 points higher than the next highest average rubric score attributed to the *Interpreting Maps* category. The average rubric score of *Assessment* is also a full 2.81 points higher than the average rubric score received by the category of *Embedded in Text*. A good deal of the disparity in average rubric scores between these categories is due to the fact that there were no less than 10 examples of the 25 (40%) total examples in the category of *Assessment* that were judged to have earned a rubric score of 5. The category with the next highest number of examples that earned a rubric score of 5 was the category of *Interpreting Maps,* which had only 2 examples earn a rubric score of 5.

Table 6.23

Categories of Social Mathematics Identified In *Magruder's* And The Social Mathematics They Address

Category	Social Mathematics Addressed	Social Mathematics Not Addressed
Interpreting Tables	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Resource management and allocation; Understanding interest; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, and other forms of information into numerical and statistical formats
Interpreting Maps	Dispersion; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data	Probability and chance; Sampling and margin of error; Mean, median, mode, average and central tendency; Communicating statistical conclusions to others; Analyzing conclusions drawn from data: Resource management and allocation; Understanding interest; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, and other forms of information into numerical and statistical formats
Interpreting Timelines	Interpreting maps, charts, graphs, diagrams, timelines, etc.	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data: Resource management and allocation; Understanding interest; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, and other forms of information into numerical and statistical formats
Interpreting Graphs	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Resource management and allocation; Understanding interest; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, and other forms of information into numerical and statistical formats

Table 6.23 (cont.)

Categories of Social Mathematics Identified In *Magruder's* And The Social Mathematics They Address

Category	Social Mathematics Addressed	Social Mathematics Not Addressed
Assessment	Dispersion; Mean, median, mode, average and central tendency; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data: Resource management and allocation; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; and Translating written, verbal, and other forms of information into numerical and statistical formats	Probability and chance; Sampling and margin of error; Understanding interest; and Drawing original conclusions from data collected as part of an original poll, study, or project
Embedded In Text	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average and central tendency; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data: Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, and other forms of information into numerical and statistical formats	Resource management and allocation; Understanding interest
Skills For Life	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average and central tendency; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data: Understanding interest; Understanding proportion; Drawing original conclusions from data; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, and other forms of information into numerical and statistical formats	Resource management and allocation; Understanding ratio and rate

Table 6.23 (cont.)

Categories of Social Mathematics Identified In *Magruder's* And The Social Mathematics They Address

Category	Social Mathematics Addressed	Social Mathematics Not Addressed
Interpreting Charts	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Understanding ration and rate; Drawing original conclusions from data	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average tendency, and central tendency; Analyzing conclusions drawn from data; Resource management and allocation; Understanding interest; Understanding proportion; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, or other forms of information into numerical and statistical formats
Interpreting Diagrams	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Understanding proportion; Understanding ratio and rate	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average tendency, and central tendency; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Resource management and allocation; Understanding interest; Drawing original conclusions from data; Drawing original conclusions from data collected as part of an original poll, study, or project; and Translating written, verbal, or other forms of information into numerical and statistical formats

This combination of the highest average rubric score of all identified categories and the highest (tied with *Skills for Life*) number of concepts and skills of social mathematics addressed suggests that the editors of *Magruder's American Government* have an established commitment to at least *assessing* students' ability to work with the concepts and skills of social mathematics. Why would the authors and editors of *Magruder's* place so much emphasis upon the quality of the assessments of students' ability to apply the concepts and skills of social mathematics, as opposed to instructional or problem-solving formats that would present opportunities to *learn* and allow them to *practice* the skills of social mathematics? The answer to this question may be related to two of the conjectures discussed in the concluding segments of previous chapters: That the authors and editors of *Magruder's American Government* may understand social mathematics to be a skill of the social studies (not specifically of civics) and because it is a skill is not directly reflected in content. Second, that the authors and editors of *Magruder's* may recognize that social mathematics is a skill of the social studies or civics, but feel that the responsibility for teaching the skills of social mathematics is the responsibility of a discipline (or disciplines) other than civics.

These two conjectures, as they apply to *Magruder's American Government*, reflect two basic premises supported by the analyses conducted for this chapter. The first premise is that if the authors and editors of *Magruder's* do indeed understand social mathematics to be a skill of the social studies (as opposed to a skill of civics), this may serve to explain why the largest number of occurrences of social mathematics within the text are not reflective of content or instruction so much as they reflect opportunities for students to practice or apply the skills of social mathematics. In other words, conceptualizing social mathematics as a skill of the social studies may serve to explain why 8 of the 9 identified categories of text (see Table 6.22) represent "problems" students are to solve (as opposed to instruction in what the concepts and skills of social mathematics are and how they should be applied to civics) by applying the concepts and skills of social mathematics. The second premise is that if the authors and editors of *Magruder's* understand social mathematics to be a skill of the social studies or perhaps civics, yet believe that instruction in social mathematics is the responsibility of a discipline other than civics, this may serve to explain why there seems to be so much emphasis on *assessing* student's abilities to use and apply social mathematics. Both of these premises, however, more than subtly suggest that the authors and editors of *Magruder's American Government* may feel that providing instruction (as opposed to practice) in the concepts and skills of social mathematics is the responsibility of teachers of another discipline. In other words, the authors and editors of *Magruder's* may feel compelled by state or national standards (or out of a feeling of obligation or some other source of pressure) to provide some *minimal level* of instruction in social mathematics, yet feel more compelled to provide many more opportunities for students to practice applying social mathematics and to assessing students on their ability to use and apply these concepts and skills.

Given this conjecture – that the authors and editors of *Magruder's* may understand social mathematics as a useful skill of civics, but that the responsibility for teaching the fundamental mathematical and statistical principles and operations behind social mathematics may rest with another discipline – does the analyses of how (and how well) the text *instructs* students in the concepts and skills of social mathematics provide additional perspective to this conjecture? To determine this, it is necessary first to discern those categories that reflect *instruction* in the concepts and skills of social mathematics from those categories that provide students with *practice* in the application of those concepts and skills. A review of the passages, activities, and questions reported in Tables 6.13 through 6.21 reveals that 7 of the 9 categories (approximately 77.8%) are dominated by activities that ask students to *apply* the concepts and skills of social mathematics to given situation. The two categories that provide direct instruction in the

Table 6.24

Examples In *Embedded in Text* That Provide Instruction In The Concepts and Skills of Social Mathematics

Page	Id Description	Rubric Level	Social Mathematics Addressed	Inst, Prac, or Info
154	18-20 year olds response to the 26th amendment	1	Analyzing conclusions drawn from data	Information
164	Size of the non-voter problem in the United States	1	Analyzing conclusions drawn from data	Information
169-70	Sociological factors for low voter turnout	1	Analyzing conclusions drawn from data	Information
218-21	Scientific polling and the polling process	4	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average tendency, and central tendency; Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Drawing original conclusions from data collected as part of an original poll, study, or project; Translating written, verbal, or other forms of information into numerical and statistical formats	Instruction
267-68	Reapportionment	1	Understanding proportion	Information
379-81	Flaws in the Electoral College	1	Dispersion; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Understanding proportion	Information and Practice
382-84	Proposed reforms to the Electoral College	1	Communicating statistical conclusions to others; Analyzing conclusions drawn from data	Information and Practice

concepts and skills of social mathematics are the categories of *Embedded in Text* and *Skills for Life*.

Clearly, Table 6.23 illustrates that the social mathematics addressed within the text itself (the category labeled *Embedded in Text*) covers 14 of the 16 (or nearly 88%) concepts and skills of social mathematics identified in Table 3.4. Contrast this result, however, with the column that indicates if an identified sample is an example of instruction, practice, or if the sample merely provides numeric information and data that students are to apply to a question or problem. Only 1 of the 7, or approximately 14.3%, of the identified examples in the category of *Embedded In Text* actually instructs students about the concepts and skills of social mathematics. This one incident of social mathematics identified in the *Embedded in Text* category – scientific polling and the polling process – is also nearly completely responsible for addressing the 14 identified concepts and skills of social mathematics.

The rate of direct instruction in the concepts and skills of social mathematics is much higher for the other identified category, *Skills for Life*. Table 6.25 depicts all 7 examples of *Skills for Life* activities that address the concepts and skills of social mathematics. All 7 examples reflect incidences of direct instruction in social mathematics. The category of *Skills for Life* covers exactly the same percentage (nearly 88%) and nearly exactly the same concepts and skills as does the category of *Embedded In Text*. While this analysis may appear to contradict the conjecture that little actual direct instruction in the concepts and skills of social mathematics takes place in *Magruder's American Government*, recall that the category of *Skills for Life* is not one that is embedded in the text. Stated another way, it is in question, given the fact that the

Table 6.25

Examples of Social Mathematics In *Skills for Life*

Page	Id Description	Rubric Level	Social Mathematics Addressed	Instruction, Practice, or Information
222	Taking A Poll	6	Probability and chance, Sampling and margin of error; Dispersion; Mean, median, mode, average, and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion; Drawing original conclusions from data collected as part of an original poll, study, or project; Translating written, verbal, or other forms of information into numerical and statistical formats	Instruction
266	Analyzing Maps	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Understanding proportion; Drawing original conclusions from data	Instruction, Practice, and Information
398	Using Time Lines	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Drawing original conclusions from data	Instruction, Practice, and Information
436	Gathering Information From Government Sources	1	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data	Instruction
453	Paying Your Taxes	3	Collecting and measuring data; Understanding interest	Instruction
600	Reading Tables and Analyzing Statistics	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Mean, median, mode, average, and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Analyzing conclusions drawn from data; Understanding proportion	Instruction, Practice, and Information
665	Interpreting Line Graphs	4	Interpreting maps, charts, graphs, diagrams, timelines, etc.; Collecting and measuring data; Communicating statistical conclusions to others; Analyzing conclusions drawn from data; Understanding proportion	Instruction, Practice, and Information

Skills for Life segments appear as separate pages at the end of chapters or units within *Magruder's*, if students are exposed to the activities and instruction that takes place within these segments.

That *Magruder's American Government* supports practice with and assessment of the concepts and skills of social mathematics is not in question. Given the results of the analyses conducted in this chapter, all of the concepts and skills of social mathematics identified in Table 3.3 are addressed within the pages of *Magruder's*. It is also clear that the majority of the identified examples of social mathematics to be found in *Magruder's American Government* achieve a reasonable level of quality when it comes to providing students with *practice* with the concepts and skills of social mathematics.

The results raise two significant questions of the analyses conducted in the preceding pages. The first concerns exactly how much *Magruder's American Government* exposes the students who use the book to the concepts and skills of social mathematics. The second concerns exactly how much *instruction* in the concepts and skills of social mathematics takes place within these same classrooms. While it may at first appear strange, given the substantial number of examples of the concepts and skills of social mathematics represented in *Magruder's*, to suggest that students who use the text may not be exposed to *instruction* in those very concepts and skills, recall that there are several issues regarding exactly where in the text these examples of social mathematics appear. In the category of *Embedded in Text*, one example from that category addressed nearly 88% of the concepts and skills of social mathematics. What of those teachers who decide to skip those pages or the chapter in which they appear? What if social studies teachers in California (*Principles of American Democracy*), Texas (*United States Government*), and Florida (*Political Science)* focus on the text itself and choose to skip the "sidebars" like *Interpreting Maps*, *Interpreting Charts*, or *Skills for Life*? It would be pure speculation to suggest just how much of the *Magruder's American*

Government text social studies teachers use when teaching *Principles of American Democracy*, *United States Government*, or *Political Science*. It is, of course, entirely possible that social studies teachers who use *Magruder's* in their classroom utilize every page, chart, diagram, map, and assessment question in the textbook. Yet it seems that, given the pressure to "cover material" – not to mention the 844 pages of text – social studies teachers may feel pressure to focus their students' attention on the text itself and reduce or eliminate time spent on charts, graphs, and diagrams that appear as "sidebars" to the text.

How Well Does Magruder's Address State Standards That Reflect Social Mathematics?

It is instructive to consider how a state textbook adoption committee might view the conjecture that students within their respective states receive little if any direct instruction in the concepts and skills of social mathematics and may also receive little or any practice in applying those concepts and skills. Recall that in the previous chapter it was demonstrated that only one state – Texas – included social studies content standards that directly address the concepts and skills of social mathematics in a clear and unambiguous manner. These three category 4 standards, adopted by the state of Texas, are aligned with the 7 examples of social mathematics identified as embedded within *Magruder's American Government* (see Table 6.18) in Table 6.26.

An analysis of the information presented in Table 6.26 reveals that only two of the three Texas social studies standards identified as directly addressing concepts and skills of social mathematics are actually addressed by the embedded social mathematics portions of *Magruder's American Government*. The example that is identified as

Table 6.26

Incidences of Social Mathematics Embedded Within *Magruder's American Government* Aligned With The Texas Category 4 Social Studies Standards

Pages	Description of Embedded Text	Texas Standards Addressed
154	One paragraph that addresses how 18-20 year olds responded to the 26th amendment. Students are asked the question, how have 18-to-20-year-olds responded to the 26th amendment?	No standard is addressed in this segment. There are no concepts or skills explained, nor are students asked to do anything with the information.
164	An explanation of the size of the non-voter problem in the United States. Two paragraphs outline statistical evidence of the problem.	No standard is addressed in this segment. There are no concepts or skills explained, nor are students asked to do anything with the information.
169-70	Two pages that detail some of the sociological factors for low voter turnout. Statistical evidence presented to illustrate how the various sociological factors identified affect voter turnout.	No standard is addressed in this segment. There are no concepts or skills explained, nor are students asked to do anything with the information.
218-21	Four pages of text that explain scientific polling and the polling process	B.21.F Use appropriate mathematical skills to interpret social studies information such as maps and graphs. B.22.C Transfer information from one medium to another, including written to visual and statistical to written or visual, using computer software as appropriate.
267-68	One paragraph that presents numeric information as it applies to reapportionment	No standard is addressed in this segment. There are no concepts or skills explained, nor are students asked to do anything with the information.
379-81	Approximately one and a half pages describing flaws in the Electoral College. A comprehensive examination of results of the 2000 Presidential Election.	B.21.F Use appropriate mathematical skills to interpret social studies information such as maps and graphs.
382-84	Proposed reforms to the Electoral College. Four paragraphs address the proportional plan.	B.21.F Use appropriate mathematical skills to interpret social studies information such as maps and graphs.

addressing these two Texas social studies standards, *scientific polling and the polling process* (appears on pages 218-221 of *Magruder's*), is identified in Table 6.24 as providing direct instruction in the concepts and skills of social mathematics. The third Texas social studies standard that mandates instruction in the concepts and skills of social mathematics – standard B.21.E: *Evaluate government data using charts, tables, graphs,* *and maps* - would fail to be addressed by any of the other examples to be found in the category of *Embedded in Text*. All three Texas social studies standards identified in the previous chapter as addressing the concepts and skills of social mathematics would be substantively addressed – at least in the form of providing students with opportunities to *practice* applying these concepts and skills – by a significant number of examples found in several of the categories as detailed in Tables 6.13 through 6.21. The only example to be found in *Magruder's* of *direct instruction* in the concepts and skills of social mathematics mandated by the third social studies content standard adopted by the state of Texas - standard B.21.E: *Evaluate government data using charts, tables, graphs, and maps* – would only come through two examples included in the category of *Skills for Life*: *Gathering Information from Government Sources* on page 436, and *Reading Tables and Analyzing Statistics*, located on page 600 of *Magruder's*.

If those responsible for textbook selection and adoption in the state of Texas rely solely upon the embedded portions of text in *Magruder's American Government* to satisfy all of the state social studies standards, it is clear that *Magruder's* fails to do so because it has been demonstrated in this chapter that *Magruder's* fails to address Texas state standard B.21.E: *Evaluate government data using charts, tables, graphs, and maps*. It is certainly not unreasonable to expect that teachers can satisfy all of a state's content standards without relying solely upon a textbook to help them do so. Yet recall that one of the attractive features of selecting textbook adoption states like Texas for this study is that the state textbook adoption boards must only approve those textbooks that address all of the state content standards. This seemingly contradictory result – that the *embedded* text of *Magruder's* fails to address all of the Texas social studies content standards but

Magruder's must address all of the state standards to be adopted for use in Texas – suggests two possibilities. The first is that the textbook adoption agency for the state of Texas indeed recognizes that the "regular text" that appears in textbooks is the most likely vehicle through which the standards are addressed, yet simply overlooked the fact that one of the Texas social studies standards was ignored in the embedded text within *Magruder's*. The second possibility is that the textbook adoption agency for the state of Texas considers *all* portions of a textbook when evaluating textbooks for statewide adoption, not just the portions of regular or embedded text in a particular book. Given that the standards published by the state of Texas for *United States Government* have remained unchanged since September 1, 1998, the first possibility – that the textbook adoption agency for the state of Texas somehow overlooked the fact that not all of the state standards for *United States Government* were addressed in the "regular text" of *Magruder's* – seems unlikely. It seems reasonable to conclude that this omission would have been corrected in the nearly seven years since the state of Texas adopted standards for *United States Government*. It also seems unlikely that the textbook adoption agency for the state of Texas would define the opportunities in which any particular standard must be addressed – i.e. the regular or embedded text – so narrowly. It seems much more reasonable to expect that the members of any textbook adoption agency would consider the text in its entirety, leaving it to the discretion of the individual teachers as to which segments they want to use.

It may be tempting to also conclude that textbook adoption agency for the state of Texas assumes that a number of different courses offered in "the social studies" could address concepts and skills of social mathematics that are possibly "missing" from (the embedded text in) *Magruder's*. Recall, however, that the state of Texas does not in reality publish standards for the social studies. The state of Texas, like the state of California, publishes individual sets of standards aligned with specific course offerings. In chapter 3 of this study, evidence was presented that the course entitled *United States Government* was the social studies course offered in the state of Texas that addresses the traditional subjects of civics. The three Texas state content standards identified in this study as directly addressing social mathematics – content standards B.21.E, B.21.F, and B.22.C – are content standards for *United States Government*. The Texas Education Agency selected *Magruder's* for statewide adoption for use in *United States Government*. Therefore *Magruder's American Government* must meet all three of these content standards if it was adopted by the state of Texas for use in *United States Government*.

If this is indeed the case, then this suggests that those responsible for selecting social studies textbooks for statewide adoption in the state of Texas (and likely in California and Florida) consider *all* portions of the text. This is an interesting conjecture. If it is an accurate one, then there is overwhelming evidence to suggest that all of the Texas social studies standards that address social mathematics are addressed through all categories of *Magruder's American Government*. There is additional evidence to suggest that all of those social studies content standards that apply to concepts and skills of social mathematics, even the ones identified in the previous chapter as content standards that *indirectly* (category 2 and 3 standards) address the concepts and skills of social mathematics, are addressed in *Magruder's American Government*. This conjecture would also hold true for the social studies standards of California and Florida – even those classified as category 2 and 3 standards – all of the state standards of California, Texas, and Florida identified as indirectly addressing the concepts and skills of social mathematics would be addressed by *Magruder's American Government* as long as the textbook adoption agencies of these states consider the passages, activities, problems, and questions within the entire text, not just in the embedded text.

There still remains the question raised as a result of the analyses conducted for this chapter concerning exactly how much *instruction* in the concepts and skills of social mathematics takes place within *Principles of American Democracy* (California), *United States Government* (Texas), and *Political Science* (Florida). The majority of categories identified in Table 6.3 provide practice with, not instruction in, the concepts and skills of social mathematics. One category, however, provides substantial instruction in how to use and apply social mathematical concepts and skills. That category – *Skills for Life* – successfully addresses 14 of the 16 (approximately 88%) concepts and skills of social mathematics identified in Table 3.3. In addition to *Skills for Life*, one segment identified in the *Embedded In Text* category also provided substantive *instruction* in the concepts and skills of social mathematics. That segment – scientific polling and the polling process (pages 218-222) – introduced students to the concepts and skills of probability and chance; sampling and margin of error; dispersion; mean, median, mode, average and central tendency; interpreting maps, charts, graphs, diagrams, timelines, etc.; collecting and measuring data; communicating statistical conclusions to others; statistical outliers in data; analyzing conclusions drawn from data: understanding proportion; understanding ratio and rate; drawing original conclusions from data; drawing original conclusions from data collected as part of an original poll, study, or project; and translating written, verbal, and other forms of information into numerical and statistical formats (approximately 88%

of the identified concepts and skills of social mathematics). The only concept and skill of social mathematics not addressed by these two categories would be resource management and allocation. Stated another way, if *Magruder's American Government* is considered in its entirety, the text provides *instruction* in 15 of the 16 (93.75%) concepts and skills of social mathematics and *practice* in all 16 concepts and skills of social mathematics.

Similar to the criticism regarding the ability of *Magruder's American Government* to support *practice* with the concepts and skills of social mathematics, it would seem that *Magruder's* ability to provide *instruction* in these same skills is limited by the number and location of these opportunities. The five pages of embedded text identified as providing instruction in the concepts and skills of social mathematics (pages 218-222) represents 0.59% of *Magruder's American Government*. The remaining opportunities to be found in the *Skills for Life* segments represent a total of an additional 0.82% of the entire *Magruder's* text. What of the teacher that skips the 5 pages concerning how to conduct a scientific poll or who skips the *Skills for Life* sections that appear at the end of some of the chapters and units?

For some additional perspective, I returned to the original conjectures I developed at the end of chapter 4 and applied to both chapters 4 and 5. These conjectures were an attempt to offer reasonable explanations for why the concepts and skills of social mathematics were either inadequately represented or not at all represented in the national and state standards. The analyses conducted in this chapter suggest that while the authors and editors of *Magruder's American Government* place a premium on assessing students' ability to apply the concepts and skills of social mathematics to situations and problems that are provided, there are many examples to be found within the text that provide students with opportunities to practice the concepts and skills of social mathematics outside of assessments. This is but one of the “dualities” of *Magruder’s* in addressing the concepts and skills of social mathematics. If only the embedded portions of text within *Magruder’s* are considered, the national and state standards that reflect tenets of social mathematics are inadequately addressed, both in terms of providing instruction in the concepts and skills of social mathematics and in terms of providing students with opportunities to practice applying these same concepts and skills. If all portions of the Magruder’s text are considered, however, the authors and editors of the text do provide some minimal level of *instruction* in the concepts and skills of social mathematics and ample opportunities for students to apply those concepts and skills to situations and problems provided by the text. In either case, *Magruder’s* fails to provide demonstrable instruction or opportunities in activities that would earn social mathematics rubric scores from the higher levels. There are few if any opportunities for students to identify issues or problems they would like to address using the concepts and skills of social mathematics to help them bring about their own unique solutions or conclusions.

There is also evidence to support the conjecture that the authors and editors of *Magruder’s* view social mathematics as a skill of the social studies. All of the categories identified in Table 6.23 deal substantively in skills – how to read a graph, how to conduct a poll, and how to interpret numeric information presented in tables to name but a few examples. What the analyses conducted for this chapter help to shed additional light upon is the reality that, at least as far as the authors and editors of *Magruder’s American Government* and the members of the Texas textbook adoption agency are concerned, the instruction (not just practice with) in the concepts and skills of social mathematics is indeed at least partially the responsibility of teachers of civics.

If there are criticisms to be made with this conclusion, one of the most significant is that it is simply unreasonable to believe that every student is asked to read every page of the *Magruder's* text and to complete all of the "sidebar" activities like *Interpreting Maps* and *Skills for Life*. Because of this possibility, it is difficult to know if social studies students who use *Magruder's* in their classrooms are taught and provided practice with the concepts and skills of social mathematics. Yet it may be equally unreasonable to suggest that students who are assigned *Magruder's* as a classroom text are directed to skip all of the 95 examples of social mathematics identified in Table 6.3. Despite these conjectures, *Magruder's American Government* does reflect those national and state content standards considered in this study identified as addressing the concepts and skills of social mathematics.

Chapter 7

Conclusions

This study addressed the question: *How have the calls for social mathematics been represented in the curricula of civics education?* I based this question on a detailed historical overview of the integration of social studies and mathematics, which revised definitions of multiple words and phrases used historically and contemporarily by social studies educators, mathematics educators, and by mathematicians to identify and describe those concepts and skills of mathematics and statistics that should be understood by all citizens. From these revisions I devised a social mathematics rubric that can be applied to any text identified as addressing the concepts and skills of social mathematics to determine the level of quality of that text in addressing those concepts and skills. I refined three layers of the curricula of civics – national standards, state standards, and nationally marketed textbooks – to provide a manageable context in which to explore the question of how the calls for social mathematics are represented in current representations of civics curricula (e.g., national standards published by the National Council for Social Studies and the Center for Civic Education, state standards of California, Texas, and Florida, and *Magruder's American Government*). After close readings of all identified levels of civics curricula, I was able to classify the treatment of social mathematics within four categories. These categorizations and the aforementioned social mathematics rubric were applied to the national standards (chapter 4), to the state standards (chapter 5) and to *Magruder's American Government* (chapter 6).

Given the results and conclusions generated by each individual chapter, I drew five general conclusions regarding how the calls for social mathematics are represented in the current official curricula of civics:

<u>Conclusion #1:</u> Some of the curricular language used to address social mathematics at all levels of the civics curriculum is ambiguous and implicit.

There does exist some indirect level of support for social mathematics among the national standards, state standards, and *Magruder's American Government*, but there is a failure to identify and comprehensively address the concepts and skills of social mathematics in a direct and unambiguous manner on the part of all three curricular levels of civics. While the national standards and performance expectations published by the National Council for the Social Studies and the Center for Civic Education include no direct language that address any of the concepts and skills of social mathematics, both include a number of examples (8 and 11, respectively) that are likely to be interpreted as addressing the concepts and skills of social mathematics by the authors and consumers of the standard, theme, or performance expectation in question. For the National Council of the Social Studies, I interpreted 31.1% of their published performance expectations for the middle grades and 43.3% of their published performance expectations for high school (performance expectations are aligned with the ten themes of the social studies). For the Center for Civic Education, 4 standards for the middle grades (5.7%) and 8 standards for high school (11.3%) imply social mathematical concepts. While no standard published by either national organization directly addresses the concepts and skills of social mathematics, some of the standards published by both organizations reflect some implicit national support for social mathematics.

States also show modest support. Neither California nor Florida directly addresses the concepts and skills of social mathematics. California publishes 5 content standards (9.8%) that imply the importance of social mathematics and Florida publishes no standard, for either the middle grades or for high school, which imply social mathematics. Texas, however, publishes content standards that directly address, in unambiguous and direct language, the concepts and skills of social mathematics. Direct representation of social mathematics comprises 3.7% of the total number of Texas content standards and social mathematics is implied in an additional 6 (7.4%) standards. Viewed together as one sample, however, the states of California, Florida, and Texas reveal little direct support for inclusion of social mathematics within the civics curriculum.

Analysis of *Magruder's American Government* revealed 95 examples of social mathematics. Moreover, *Magruder's* includes examples of all 16 concepts and skills of social mathematics that I identified as important. Yet, only 7.3% of these examples of social mathematics were embedded within the text. The other 92.7% of the identified examples of social mathematics were included in sidebars, assessments, and end of the chapter activities. If the number of pages in *Magruder's* upon which practice or instruction in social mathematics appear is compared with the total number of pages in the text, no more than 12.4% of the text is devoted to instruction and practice in social mathematics. This represents an extremely liberal estimate, given that the vast majority of examples of social mathematics that appear in *Magruder's* are in the form of maps, charts, or graphs that rarely consume more than a quarter to a half of a page of text.

<u>Conclusion #2:</u> The quality of some of the representations of social mathematics in the official curricula of civics is low.

Little can be said concerning the quality of the representation of social mathematics in the national standards published by the National Council for the Social

Studies or the Center for Civic Education because neither set of national standards directly address social mathematics. It would be an exercise in pure speculation to attempt to ascertain the level of quality of the category 3 standards published by either organization because the premise of category 3 standards is that they reflect standards, themes, or performance expectations that only *imply* social mathematics – not standards, themes, or performance expectations that directly address those concepts and skills. Much of the difficulty in ascertaining the level of quality of category 3 standards stems from the reality that it would be an impossible task to attempt to determine the nearly infinite number of ways the authors and consumers of these category 3 standards would (or would not) interpret the ways in which the standard could address the concepts and skills of social mathematics.

There are opportunities to address the level of quality of the representations of social mathematics in the content standards adopted by Texas and in *Magruder's American Government*. The three content standards adopted by the state of Texas address a total of 6 of the 16 (37.5%) identified examples of social mathematics listed in Table 3.4. These 6 examples were: *Interpreting maps, charts, graphs, timelines, etc. that depict mathematical or statistical data; drawing original conclusions from data; dispersion; mean, median, mode, average and central tendency; statistical outliers in data; translating written, verbal, or other forms of information into mathematical or statistical formats (and the converse of this)*. The average rubric score attributed to these 6 examples is a 2.4, with none of the examples achieving an individual rubric score of more than 4. This suggests that the three Texas content standards identified as addressing concepts and skills of social mathematics mandate that students and teachers work with these 6 concepts and skills, but there may not be opportunities for students to work with data sources outside of the traditional forms of textbook and teacher-provided information and there may be few if any opportunities for students to apply social mathematical concepts and skills to unique problems that the students generate.

Similar evidence exists regarding the quality of the representations of social mathematics identified in the *Magruder's* text. Approximately 92% of the examples of social mathematics identified in *Magruder's* are not in the form of passages, questions, or activities that are part of the "standard" text. There is evidence to suggest that only 7.3% of the occurrences of social mathematics to be found in *Magruder's* are embedded within the standard text and that the remaining 92.5% of the occurrences of social mathematics appear as sidebars, end of the chapter activities, or as assessment questions. The level of quality of those treatments of social mathematics that appear within the standard text of *Magruder's* scored an average of 1.43, which suggests that many of these examples asked students to identify numeric information within a passage, question, or activity, to translate numeric information into written and verbal formats, or to manipulate and apply data in a provided context. Only 1 of the 7 examples of embedded text identified as addressing the concepts and skills of social mathematics earned a rubric score of 4 – the remaining 6 examples all were scored as a 1. For this reason, the average rubric score of 1.43 assessed to the category of *Embedded in Text* is misleading. In reality, 85.7% of the examples of embedded text that addressed concepts and skills of social mathematics only asked students to identify numeric data. The one example, *scientific polling and the polling process*, earned a rubric score of 4 because some of the passages, questions, and activities within the example did require students to draw their own conclusions to a question or problem presented by the authors of *Magruder's*. Similar to the criticisms regarding the quality of the Texas content standards that were identified as addressing the concepts and skills of social mathematics, *Magruder's American Government* presents few opportunities for students to either work with data sources outside of the traditional forms of textbook and teacher-provided information or for students to apply social mathematical concepts and skills to unique problems that they generate

<u>Conclusion #3:</u> The treatment of social mathematics is uneven across the three levels of curriculum.

The use of the word *uneven* in this conclusion statement is meant to convey the notion that similar rates of inclusion of social mathematics are not to be found among the three layers of civics curricula considered in this study. The level of direct and unambiguous representation of social mathematics within the *Magruder's* text (estimated to be 12.4%) does exceed the levels of direct and unambiguous representation to be found in the national standards published by the National Council for the Social Studies (0%), the national standards published by the Center for Civic Education (0%), the state content standards adopted by California and Florida (0%), and the state content standards adopted by Texas (3.7%).

Rates of inclusion of passages, questions, or activities that imply social mathematics are similarly dispersed among the three layers of curricula. Results indicate that 31.1% of the NCSS middle level performance expectations and 43.3% of the high school performance expectations aligned with civics imply social mathematics. Results also indicate that 5.7% of the middle level standards and 11.3% of the high school standards adopted by the Center for Civic Education are similarly classified. While none of the Florida social studies content standards aligned with *Political Science* imply social mathematics, 9.8% of California social studies standards aligned with *Principles of American Democracy* and 7.4% of the Texas social studies standards aligned with *United States Government* did imply social mathematics. None (0%) of the passages, questions, or activities in *Magruder's American Government* imply social mathematics.

<u>Conclusion #4:</u> Textbooks direct attention to social mathematics

I theorized in the inception of this study that a "top down" relationship existed among the levels of the curricula of civics. I further theorized that the standards published by the National Council for the Social Studies and the standards published by the Center for Civic Education would drive the state content standards of California, Texas, and Florida. These state social studies content standards, in turn, would drive the content of those civics texts adopted by these three states. This was not the case with social mathematics. From the perspective of measuring rates of occurrence of social mathematical concepts and skills in text, *Magruder's American Government* emerges as the leading source of instruction and practice in social mathematics among the representations of the official curricula of civics considered in this study. The national content standards for the social studies published by NCSS and the national civics standards published by the CCE do not directly address social mathematics (0% occurrence in both texts). Neither the state of California or Florida adopted social studies content standards aligned with civics instruction that directly address social mathematics (0% occurrence in both texts). Only the state of Texas publishes social studies content standards aligned with civics instruction that directly address the concepts and skills of social mathematics (3.7% of the text). While it remains difficult to quantify the exact portion of the *Magruder's* text that is devoted to direct instruction in and practice with the concepts and skills of social mathematics (12.4% is cited as an estimate), the text does address these concepts and skills.

I include this concluding statement because it ran contrary to what I believed the relationship to be among layers of curricula. I initially assumed that because of the prominent national role played by the NCSS, what the organization did or did not include within their national standards would be reflected in state standards and in textbooks. The results of this study changed my perception as it was revealed that both the state of Texas and the authors and editors of *Magruder's American Government* directly address social mathematics, while the treatment of social mathematics by the NCSS and the CCE is ambiguous at best.

<u>Conclusion #5:</u> The official civics curricula does not systematically address social mathematics.

The results of this study that support the first four conclusions together support this fifth conclusion. After closely reading the national, state, and textbook standards and curricula, I concluded that the social studies curriculum has not systematically addressed the calls for social mathematics in civics education. National standards published by the National Council for the Social Studies and the Center for Civic Education at best imply the important role that social mathematics should play in civics. States sampled for this study treat social mathematics marginally. *Magruder's American Government* offers primarily rudimentary practice and little instruction in social mathematics. The majority of examples of social mathematics identified in *Magruder's* marginalizes these opportunities to sidebars and end of chapter activities, further minimizing the chances that students enrolled in courses that make use of the *Magruder's* text will have the chance to work with social mathematical concepts and skills.

What Accounts for These Conclusions and Conditions?

Now that I have presented a review regarding the evidence to support the five general conclusions, *why is there little support for social mathematics?* As argued in chapters 1 and 2, the social studies education community is at least aware of the substantial discussion that has unfolded in the last two decades concerning social mathematics. Several nationally recognized social studies educators, including Michael Hartoonian, Gloria Alter, and David Whitin have repeatedly advocated the inclusion of social mathematics in the civics classroom. In addition, the NCSS itself has published several articles on the importance of social mathematics in the civics classroom and dedicated an entire issue of *Social Studies & The Young Learner* (Vol. 6 No. 1, 1993) to how social mathematics could and should be used in all social studies classrooms, not just in civics. Michael Hartoonian, arguably the greatest proponent of social mathematics, was on the NCSS task force that wrote and adopted the national standards for the social studies. A lack of awareness of social mathematics cannot explain why there exists so little support for social mathematics within the civics curriculum.

The hypothesis I developed to explain the absence of social mathematics in the official curricula of civics is that social mathematics is perhaps viewed as a useful skill of citizenship, but it is assumed that an understanding of social mathematics and its application to civic practices will develop within students from a study of the other disciplines of the social studies. Therefore, social mathematics is not adequately represented in the official curricula of civics.

Table 7.1

Examples of Uses of Mathematical and Statistical Skills and Concepts That Appear In NCSS Performance Expectations Not Related to the Specific Discipline of Civics

Performance Expectation	Theme	Corollary in Social Mathematics
III.A (grades 5-8) elaborate mental maps of locales, regions, and the world that demonstrate an understanding of the relative location, direction, size, and shape	III. People, Places, & Environments	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Understanding proportion
III.C (grades 5-8) use appropriate resources, data sources, and geographic tools such as aerial photographs, satellite images, geographic information systems (GIS), map projections, and cartography to generate, manipulate, and interpret information such as atlases, data bases, grid systems, charts, graphs, and maps	III. People, Places, & Environments	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data
III.D. (grades 5-8) estimate distance, calculate scale, and distinguish other geographic relationships such as population density and spatial distribution patterns.	III. People, Places, & Environments	Understanding proportion; Dispersion; Understanding ratio and rate; Collecting and measuring data
III.A. (grades 9-12) refine mental maps of locales, regions, and the world that demonstrate an understanding of the relative location, direction, size, and shape	III. People, Places, & Environments	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data; Understanding proportion
III.C. (grades 9-12) use appropriate resources, data sources, and geographic tools such as aerial photographs, satellite images, geographic information systems (GIS), map projections, and cartography to generate, manipulate, and interpret information such as atlases, data bases, grid systems, charts, graphs, and maps	III. People, Places, & Environments	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data
III.D. (grades 9-12) calculate distance, scale, area, and density, and distinguish spatial distribution patterns	III. People, Places, & Environments	Understanding proportion; Dispersion; Understanding ratio and rate; Collecting and measuring data
VII.B (grades 5-8) describe the role that supply and demand, prices, incentives, and profits play in determining what is produced and distributed in a competitive market system	VII. Production, Distribution, & Consumption	Collecting and measuring data; Drawing original conclusions from data; Resource management and allocation; Communicating statistical conclusions to others
VII.B (grades 9-12) analyze the role that supply and demand, prices, incentives, and profits play in determining what is produced and distributed in a competitive market system	VII. Production, Distribution, & Consumption	Collecting and measuring data; Drawing original conclusions from data; Resource management and allocation; Communicating statistical conclusions to others

This hypothesis reflects two related conditions that may explain why the civics curriculum does not systematically address social mathematics. The first condition is that social mathematics may be understood as a skill of citizenship and therefore may be underrepresented within the content standards published by national and state organizations. The second condition is that social mathematics may be understood as a set of concepts and skills that can be developed from the study of other disciplines of the social studies that make use of mathematics and statistics. To test this hypothesis, I returned first to the national standards published by the National Council for the Social Studies. A review of all of the themes, standards, and performance expectations published by the National Council for the Social Studies reveals some examples of performance expectations that imply social mathematics, or perhaps more precisely, address the ways in which mathematics and statistics can both inform and be used in various disciplines. There are 8 additional performance expectations in two additional themes published by the NCSS that make use of the words *calculate*, *data source*, *maps*, *charts*, *graphs*, *data bases*, and *estimate* that imply social mathematics. These 8 category 4 performance expectations are aligned with NCSS theme 3, *People, Places, & Environments* and NCSS theme 7, *Production, Distribution, & Consumption*. An examination of Table 7.1 reveals that these eight performance expectations in grades five through twelve address eight distinct concepts and skills that have corollaries in social mathematics, or exactly 50% of the total number of concepts and skills of social mathematics identified in Table 3.4.

The eight distinct concepts and skills correlated with the following eight examples of social mathematics: Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; collecting and measuring data; understanding proportion; dispersion; understanding ration and rate; drawing original conclusions from data; resource management and allocation; and communicating statistical conclusions to others. The eight remaining concepts and skills of social mathematics not addressed were: Probability and chance; sampling and margin of error; mean, median, mode, average tendency, and central tendency; statistical outliers in data; analyzing conclusions from data; understanding interest; drawing original conclusions from data collected as part of an original poll, study, or project; and translating written, verbal, or other forms of information into numerical and statistical formats.

There is additional evidence beyond the eight performance expectations enumerated above that the NCSS may view social mathematics as a skill of the social studies as opposed to a specific skill of civics. An appendix is included in the last few pages of *Curriculum Standards for the Social Studies*. The appendix lists three "Essential Skills for Social Studies" – *acquiring information*, *organizing & using information*, and *interpersonal relationships and social participation* – along with a list of sub skills (1994, pp. 148-149). Although this appendix seems more like an afterthought than a serious attempt to address skills of the social studies (it is an appendix, there is no explanation as to its purpose, and it makes use of a strange pie graph icon that pictorially describes the "suggested strength of instructional effort"), it does list several examples of how mathematics and perhaps statistics can serve the social studies. The most direct examples are included in two sub skills of *Acquiring Information*, listed under "maps, graphs, and graphics" (1994, p. 148):

1. Use scale and compute distances

2. Interpret graphs

The placement of these two sub skills within “maps, graphs, and graphics” suggest that the NCSS task force may view these skills as skills of geography, though it is quite possible that the second skill of interpreting graphs could apply to any of the traditional disciplines of the social studies. These sub skills are similar to the social mathematical concepts and skills of collecting and measuring data and interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data.

There are 4 additional sub skills that sound strikingly similar to social mathematics, all of which are categorized under *Organizing & Using Information*. Two of the sub skills, included under “classify information,” are (NCSS, 1994, p. 149):

1. Place in proper sequence:
    a. order of occurrence
    b. order of importance

2. Place data in tabular form: charts, graphs, and illustrations.

Similar to the sub skills included under “maps, graphs, and graphics,” the two sub skills listed above could be skills taught and practiced in any social studies classroom. The first of these sub skills does not have a direct corollary in social mathematics. The two examples of social mathematics that are most closely aligned with the sub skill of sequencing would be collecting and measuring data and communicating statistical conclusions to others. The second sub skill, placing data in tabular form, does not seem to have a direct corollary in social mathematics either. The example of social mathematics that would be most closely aligned with this sub skill would be interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data.

The other two sub skills that appear to make use of mathematics and statistics are categorized under "analyze information", and "decision making skills," respectively (NCSS, 1994, p. 149):

> 3. Detect bias in data presented in various forms: graphics, tabular, visual, and print.
>
> 4. Identify alternative actions and predict likely consequences of each.

Similar to the two sub skills listed under "classify information," neither of the two examples above have a direct corollary in social mathematics. In the case of the first example, the closest social mathematical example would be interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data. In the case of the second sub skill, the most likely social mathematical corollary would be analyzing conclusions drawn from data and communicating statistical conclusions to others.

The inclusion of the appendix of *Essential Skills for Social Studies* suggests that the NCSS conceptualizes a role for mathematics and statistics within the social studies. The language used to describe each skill seems carefully crafted and selected as to convey the sense that all of the skills are not the domain of any one discipline of the social studies; rather, they are to be practiced in all social studies classrooms. The inclusion of the appendix of *Essential Skills for Social Studies* may also serve to explain why the concepts and skills of social mathematics are not reflected in the national content standards, themes, or performance expectations published by the NCSS identified as addressing civics education.

National Standards Adopted by Other Disciplines of the Social Studies

If the NCSS recognizes the roles that mathematics and statistics can play in some of the disciplines of the social studies, *what of the national standards published by organizations that represent the specific disciplines of the social studies? Do the individual disciplines of the social studies recognize mathematics and statistics as comprising a set of skills useful to the study of their disciplines?* Writing in the *Curriculum Standards for Social Studies*, the NCSS task force identified the organizations that publish national standards for the disciplines of history, geography, civics, and economics. For the discipline of history, NCSS identified the National Center for History in the Schools as the body that publishes national standards. For the discipline of geography, NCSS identified the National Council for Geographic Education as the body that publishes national standards. For the discipline of civics, NCSS identified the Center for Civic Education as the body that publishes national standards. For the discipline of economics, NCSS identified The National Council on Economic Education as the body that publishes national standards. All four of these organizations have indeed emerged as *the* national organizations that publish *the* national standards in their respective disciplines. *Are there sections included within the national standards publications of these organizations that address the ways in which mathematics and statistics can both inform and be used in their respective disciplines?*

The *National Standards in History*, published in 1996 by the National Center for History in the Schools, divides content standards for the middle and upper grades into two classifications: United States History for grades nine through twelve and World History for grades five through eight. These two categories are further divided into eras, United States History comprising ten eras and World History comprising nine eras. The eras are further divided into general standards (31 standards for United States History and 46 standards for World History). These general standards are still further divided into specific content standards that should be addressed through the fulfillment of a given general standard.

In keeping with the hypothesis presented at the end of the previous section, a reading of the *National Standards for History* was conducted to determine if the National Center for History in the Schools identifies skills of historical study and if those skills make use of mathematics and statistics. This pattern was repeated with the standards publications of the other national organizations recognized by the NCSS as adopting content standards for their respective disciplines. The results appear on the following pages.

In the case of *National Standards for History*, the National Center for History in the Schools devotes a chapter entitled "Standards in Historical Thinking". These 5 standards are as follows (1996, pp. 14-24):

1. Chronological Thinking
2. Historical Comprehension
3. Historical Analysis and Interpretation
4. Historical Research Capabilities
5. Historical Issues – Analysis and Decision-making

A review of the sub standards enumerated under these 5 general standards reveals several examples of how mathematics and statistics are addressed in the skills of history (see Table 7.2).

Geography for Life, published in 1994 by the National Geographic Research and Exploration on behalf of the National Council for Geographic Education, divides content standards for the middle and upper grades by grade level: National Geography Standards

Table 7.2

Examples of Uses of Mathematical and Statistical Skills and Concepts That Appear In The National Standards of the Disciplines of the Social Studies

Skill	Discipline	Corollary In Social Mathematics
1.A Measure and calculate calendar time	History	Collecting and measuring data
1.E Interpret data presented in timelines	History	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data
2.E Draw upon data in historical maps	History	Collecting and measuring data
2.F Utilize visual and mathematical data presented in charts, tables, pie and bar graphs, flow charts, Venn diagrams, and other graphic organizers	History	Collecting and measuring data; Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data
3.E Analyze cause-and-effect relationships and multiple causation, including the importance of the individual, the influence of ideas, and the role of chance	History	Probability and chance
SS2.1.A Enter and retrieve population information on a computer, using databases, spreadsheets, and other sources	Geography, grades 5-8	Collecting and measuring data; Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data
SS2.2.A Use cartograms, such as one dealing with petroleum production to prepare a list of major producers	Geography, grades 5-8	Collecting and measuring data; Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data
SS2.2.C Describe phenomena reported on a map (e.g., use dot maps to make statements about population densities in an area in 1910, 1950, and 1990)	Geography, grades 5-8	Collecting and measuring data; Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Drawing original conclusions from data
SS3.1.A Use area data to create choropleth maps (e.g., prepare a map showing areas of food surplus and deficit based on World Bank or Population Reference Bureau data on calories consumed per year per person; use voting data by state to map the vote for Abraham Lincoln in the presidential election of 1860)	Geography, grades 5-8	Collecting and measuring data; Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Drawing original conclusions from data
SS3.1.B Use maps to plot information contained in graphs	Geography, grades 5-8	Collecting and measuring data; Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Translating written, verbal, or other forms of information into statistical formats (and the converse of this)
SS3.3.A Create a table to compare data on a specific topic for different geographic regions (e.g., birth and death rates for nations in Asia)	Geography, grades 5-8	Collecting and measuring data; Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data
SS.3.3.C Organize data in tables or diagrams to make decisions or draw conclusions	Geography, grades 5-8	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Drawing original conclusions from data

Table 7.2 (cont.)

Skills Identified by Individual Disciplines of the Social Studies that Reflect Social Mathematics

Skill	Discipline	Corollary In Social Mathematics
SS.4.2.A Use data obtained from quantitative methods of analysis to identify trends and patterns in data	Geography, grades 5-8	Dispersion; Mean, median, mode, average tendency, and central tendency; Collecting and measuring data; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data
SS.4.2.B Produce summaries of geographic information (e.g., use descriptive statistics such as average, median, mode, and range to determine the nature of the distribution of per capita income by nation or snowfall by county)	Geography, grades 5-8	Dispersion; Mean, median, mode, average tendency, and central tendency; Collecting and measuring data; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data
SS.4.2.C Cross-tabulate the occurrences of geographic variables to discover whether they co-vary spatially	Geography, grades 5-8	Dispersion; Mean, median, mode, average tendency, and central tendency; Collecting and measuring data; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data
SS.4.3.C Compare maps of voting patterns, ethnicity, and congressional districts to make inferences about distribution of political power in a U.S. state or region at different periods	Geography, grades 5-8	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Drawing original conclusions from data
SS.5.1.A Use data from a geographic database to suggest alternative locations for a new road, a park, or a garbage dump	Geography, grades 5-8	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Drawing original conclusions from data; Resource management and allocation
SS.1.1.B Study multiple sources of graphic and written information (e.g., databases, graphs, photographs, and firsthand accounts) to list geographic questions and organize a procedure to answer them)	Geography, grades 9-12	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Drawing original conclusions from data
SS.2.1.A Gather data in the field by multiple procedures – observing, identifying, describing, organizing, sketching, interviewing, recording, measuring)	Geography, grades 9-12	Collecting and measuring data
SS.2.1.C Gather data by spatial sampling in both secondary sources and the field	Geography, grades 9-12	Collecting and measuring data; Sampling and margin of error
SS.2.1.D Use quantitative measures (e.g., means, medians, and modes) to describe data	Geography, grades 9-12	Dispersion; Mean, median, mode, average tendency, and central tendency; Collecting and measuring data; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats (and the converse of this)

Table 7.2 (cont.)

Skills Identified by Individual Disciplines of the Social Studies that Reflect Social Mathematics

Skill	Discipline	Corollary In Social Mathematics
SS3.2.A Use scatter graphs – plots of the value of one item against another item – to display the association between two items	Geography, grades 9-12	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data
SS.3.2.B Prepare diagrams that illustrate geographic information	Geography, grades 9-12	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data
SS.3.2.C Use line graphs to show changing patterns through time (e.g., rural population in the United States from 1890 to 1990; energy consumption in different regions of the world at ten-year intervals from 1950 to the present; telephone connections in the United States, 1890 to 1990)	Geography, grades 9-12	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Collecting and measuring data
SS.4.1.A Produce descriptive and analytic statistics to support the development of geographic generalizations	Geography, grades 9-12	Probability and chance; Sampling and margin of error; Dispersion; Mean, median, mode, average tendency, and central tendency; Collecting and measuring data; Communicating statistical conclusions to others; Statistical outliers in data; Understanding proportion; Understanding ratio and rate; Drawing original conclusions from data; Translating written, verbal, or other forms of information into numerical and statistical formats (and the converse of this)
SS.4.1.B Calculate ratios between local measures and national averages of given geographic phenomenon	Geography, grades 9-12	Understanding ratio and rate
SS.4.2.A Compare maps of geographic information at different periods to determine relationships	Geography, grades 9-12	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data; Drawing original conclusions from data
SS.4.2.B Interpret information from several maps simultaneously (e.g., use maps showing family income, transportation networks, resources, and other data to develop ideas on why some regions prosper and others do not)	Geography, grades 9-12	Interpreting maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data
SS.4.2.C Draw conclusions about cause and effect by correlating geographic information	Geography, grades 9-12	Collecting and measuring data; Drawing original conclusions from data
SS.4.3.A Use a balance sheet to evaluate the costs and benefits of making various decisions about geographic issues	Geography, grades 9-12	Collecting and measuring data; Drawing original conclusions from data
SS.4.3.B Determine relationships by analyzing and interpreting geographic data	Geography, grades 9-12	Collecting and measuring data; Drawing original conclusions from data
SS.5.3.A Use a geographic model to predict consequences on the basis of multiple sources of data	Geography, grades 9-12	Collecting and measuring data; Drawing original conclusions from data

for grades five through eight and National Geography Standards for grades nine through twelve. The content standards for both grade levels are enumerated under the same 6 general themes: *The World in Spatial Terms*, *Places and Regions*, *Physical Systems*, *Human Systems*, *Environment and Society*, and *The Uses of Geography*. These 6 general themes of geographic study are still further divided into more specific content standards. In *Geography for Life*, the National Council for Geographic Education devotes an entire chapter to identifying and explaining the skills of geography. Five general skills are listed (1994, pp. 42-44):

1. Asking geographic questions
2. Acquiring geographic information
3. Organizing geographic information
4. Analyzing geographic information
5. Answering geographic questions

These 5 general skill classifications are followed by several sub skills that provide examples of what students should know and understand how to do. A number of sub skills reveal several examples of how mathematics and statistics are addressed in the skills of geography (see Table 7.2).

The *National Standards for Civics and Government*, analyzed in chapter 4, was published in 1994 by the Center for Civic Education. Similar to the national geography standards, the civics standards published by the Center for Civic Education are divided by grade level (K-4 standards, 5-8 standards, and 9-12 standards). The general standard framework for grades 5 through 8 are the same as those for grades 9 through 12, and include 5 general themes posed as questions: *What are civic life, politics, and government*; *What are the foundations of the American political system*; *How does the government established by the Constitution embody the purposes, values, and principles* *of American Democracy*; *What is the relationship of the United States to other nations and to world affairs*; and *What are the roles of the citizen in American democracy*.

In *National Standards for Civics and Government*, the Center for Civic Education includes within the introduction to the document three pages devoted to identifying two classifications of skills for civics and government: intellectual skills and participatory skills. Six intellectual skills are identified (1994, p. 5):

1. Identify
2. Describe
3. Explain
4. Evaluate a position
5. Take a position
6. Defend a position

None of the descriptions of these six intellectual skills imply use of mathematics or statistics. In addition to the 6 intellectual skills, 4 participatory skills are identified (CCE, 1994, p. 5):

1. The capacity to influence policies and decisions by working with others
2. Clearly articulating interests and making them known to key decision and policy makers.
3. Building coalitions, negotiating, compromising, and seeking consensus
4. Managing conflicts

Several examples are offered of the kinds of activities students could engage in to demonstrate mastery of these 4 intellectual skills. None of the examples imply social mathematics.

The *National Content Standards In Economics*, published in 1997 by the National Council on Economic Education, lists 20 content standards to be addressed by all grade levels. A description follows each content standard, after which appear three sets of benchmarks that describe the activities students are to be able to do or the abilities students are to be able to demonstrate as a result of satisfying the particular standard. Benchmarks are established for the 4th, 8th, and 12th grades. A student should be able to achieve all of the benchmarks enumerated under a particular grade level once the student reaches the particular benchmark grade.

In *National Content Standards in Economics*, the National Council on Economic Education devotes a paragraph in the introduction to the document to identify the skills of economic reasoning: The ability of students to (a) identify economic problems, alternatives, benefits, and costs; (b) analyze the incentives at work in an economic situation; (c) examine the consequences of changes in economic conditions and public policies; (d) collect and organize economic evidence; and (e) compare benefits with costs (1997, p. xi). Unlike the publications of the other specific disciplines of the social studies, *National Content Standards in Economics* does not elaborate upon these skills further. For this reason, no skill is included in Table 7.2, although it is relatively easy to extrapolate that many of the concepts and skills of social mathematics are at least implied.

Results presented in Table 7.2 suggest that many of the individual disciplines of the social studies make use of mathematical and statistical skills as they apply to specific skills of the discipline. The disciplines of history and geography make use of mathematical and statistical skills that correlate with 87.5% of the concepts and skills of social mathematics identified in Table 3.4. It is to be expected that the national standards in geography would include references to scale, distance, direction, size, proportion, population densities, ratios – as well as a myriad of other concepts and skills – that are decidedly mathematical and statistical in nature. It is also to be expected that the national standards in economics would include references to interest, rate, calculation, proportion, income, taxation – as well as a myriad of other concepts and skills – that are decidedly mathematical and statistical in nature.

The information presented in Table 7.2 provides additional support for the conclusion that the National Council for the Social Studies may indeed understand social mathematics to be a useful skill of social studies (as opposed to specifically civics) and it is widely assumed by the NCSS and the Center for Civic Education that instruction and practice in these concepts and skills will take place in disciplines of the social studies other than civics. This combination – that the NCSS task force understands social mathematics to be a skill and that the skills of social mathematics are to be taught in all of the disciplines of the social studies – would serve to explain why the concepts and skills of social mathematics are not directly addressed in the themes and performance expectations published by the NCSS identified as representing civic instruction.

State Social Studies Content Standards and Social Mathematics

It is quite possible that the state education agencies of California, Texas, and Florida view social mathematics in a similar manner (or simply follow the recommendations of the NCSS regarding the adoption of content standards when crafting their own state standards) and this would serve to explain why little direct reference to the concepts and skills of social mathematics is to be found in the Texas content standards (3.7% of the Texas standards for *United States Government*) and no direct reference to the concepts and skills of social mathematics is to be found in the content standards published by the states of California and Florida.

There exists additional evidence to support this conclusion, evidence presented in the analyses of state content standards presented in chapter 5. Recall the three Texas social studies content standards aligned with *United States Government* that directly address social mathematics (2003, p. C-37 – C-38):

> B.21.E *Evaluate government data using charts, tables, graphs, and maps.*
>
> B.21.F *Use appropriate mathematical skills to interpret social studies information such as maps and graphs.*
>
> B.22.C *Transfer information form one medium to another, including written to visual and statistical to written or visual, using computer software as appropriate.*

I identified these three Texas content standards as appearing in all social studies courses offered in Texas in grades 6 through 12 under the heading of *Social Studies Skills*. This is significant because it suggests that the Texas Education Association, much like the National Council for the Social Studies and the Center for Civic Education, may view social mathematics as a skill of the social studies – not a skill that is specifically the domain of civics. These two related conclusions, that the state of Texas views social mathematics as a skill of the social studies and as such social mathematics should be addressed in the other disciplines of the social studies, provides more possible evidence for why the concepts and skills of social mathematics are underrepresented in those state content standards aligned with courses identified as being most civic-related.

***Magruder's American Government* and Social Mathematics**

The social studies content standards adopted by Texas were the only state standards considered for this study that directly address social mathematics. *Magruder's* must address every one of the state content standards of California, Texas, and Florida if the text is to be adopted by the textbook adoption agencies that represent these states. In the case of social mathematics, it has been demonstrated that *Magruder's* addresses Texas social studies content standards B.21.E, B.21.F, and B.22.C. It was also demonstrated that the assessment questions in *Magruder's* address 12 of the 16 (75%) identified concepts and skills of social mathematics and earned the highest average rubric score (4.24) of any of the 9 categories of social mathematics identified in the text. This suggests that the authors and editors of *Magruder's* are concerned with the comprehensiveness and quality of their assessments of students' abilities to work with social mathematics while at the same time devoting comparatively little attention to providing students with instruction (4 pages total) in why social mathematics is important or how it is useful to citizens. This imbalance between instruction and assessment (to say nothing of the copious amounts of practice with social mathematical concepts evident in *Magruder's*) suggests that the authors and editors of *Magruder's* are aware of their need to address state content standards and perceive a need to provide a platform for practice and assessment in social mathematics.

Why The Specific Discipline of Civics Needs Social Mathematics

Why is the notion of providing instruction and practice in social mathematics across the disciplines of the social studies – instead of within the discipline of civics – unsatisfactory? Primarily because the individual disciplines of the social studies provide some level of instruction and practice in using the skills of mathematics and statistics in their respective disciplines. National organizations that publish standards for the disciplines of the social studies may be addressing mathematics and statistics, but they are not addressing *social mathematics*.

The organizations that publish standards in history, geography, and economics embrace the application of mathematical and statistical skills *within the context of the discipline*. This was demonstrated by examining the ways in which national organizations make use of mathematics and statistics in the skills of their respective disciplines. History makes use of mathematics and statistics in the context of historical analysis and research capabilities. Geography makes use of mathematics and statistics in acquiring, organizing, and analyzing geographic information such as global positioning, average rainfall, and human migratory patterns. Economics makes use of mathematics and statistics in forecasting, budgeting, measuring the economic health of a nation, and establishing prices. All of the disciplines of the social studies make use of mathematics and statistics *within the context of their subject matter*.

Where within the national social studies content standards published by the NCSS and the national civics content standards published by the CCE is the context provided that demonstrates the importance of mathematics and statistics (social mathematics) in civics? Where within the skills of citizenship are the direct and unambiguous references to social mathematics? *Why is it important to provide context for, instruction in, and practice with the concepts and skills of social mathematics as they apply to civics?*

Ignoring how and why the skills of social mathematics are important to every American citizen places the individual and our democracy in peril. As numbers and statistics are increasingly used to make meaning, present and support positions, defend actions taken or not taken, and to convince people to *do something*, power shifts to those who understand and can manipulate numbers. An American citizenry that fails to understand how statistical information is both used and abused by the media as well as private and public organizations is at economic, legal, political, and personal risk.

The analogy of literacy offered by several contemporary mathematicians and mathematics educators is compelling. Numbers and statistics, much like letters and words, need interpretation and need to be understood in context. Statistics is not a privileged language of understanding, making meaning, impartiality, or of "truth". The language of statistics is not unlike the more familiar textual language in that numbers, just like words, can distort or misrepresent information. In one way, statistics and information represented numerically may actually present a greater danger to the average citizen because numerical information seems to be consumed by the general public with much less skepticism and questioning, as if numbers are both impartial and effectively and accurately represent the "truth." Understanding numerical and statistical information is an imperative of civics education when one considers the explosive growth of information represented numerically or statistically through the national media and other public and private sources of information. The ability to understand and apply the concepts and skills of social mathematics can help citizens make meaning of information, corroborate or refute information and conclusions, and generate important civic questions. Social mathematics is another important tool for the twenty-first century American citizen to take in hand.

It is important that the concepts and skills of social mathematics find support in civics. It is not reasonable to rely on the other disciplines of the social studies (just as it is unreasonable to rely on the discipline of mathematics) to equip students with the knowledge and skills that they need to be citizens in twenty-first century America. The ways in which mathematics and statistics can inform, and in turn be utilized by and in the disciplines of economics, geography, history, consumer economics, sociology and psychology, has never been in question. The issue, as Hartoonian (1989), Paulos (1995), Steen (1990), and others have pointed out, is *context*. The student who is adept at calculating the demand for a given product may not understand if his vote for a proposition to fund a local waste incinerator project was a vote for or against the standard of living enjoyed by those in his community. The student who is able to compute scale on a map may not understand how her retirement is in jeopardy given the current status of social security. The student who can accurately measure and calculate calendar time may make any number of poor choices concerning everything from health insurance to college savings plans. Decisions like these are often not thought of as having civic implications – until taxpayers are required to shoulder the burden of the poor choices and decisions of others.

There is an individual and social cost to the American citizen’s naiveté with how numbers and statistics can misrepresent and distort information. If the American news media conspired to misrepresent information for some political or economic purpose, Americans would be outraged by this violation of our democratic ideals. Yet we stand quietly as scores of news reports and articles that rely on numeric arguments and statistical conclusions are misunderstood and misinterpreted by a significant proportion of the American citizenry. Far too often, these misunderstandings and misinterpretations cause American citizens to reach inaccurate conclusions and make poor decisions, decisions that can lead to tremendous individual and societal cost.

A Recommendation for a Policy Campaign for Social Mathematics

Students of civics need to understand the social mathematics behind so much of the ever-increasing numerical data and information presented to them via the media outlets and other sources of private and public information. The fantastic increases in both the amount of information available and ability to access this information is only meaningful and useful to an American citizenry if the information is fully understood by the consumer. Citizens need to learn to be more comfortable with social, economic, political, legal, personal, professional, and health-related information presented in increasingly statistical formats. Citizens need to learn how to use and intelligently consume this information in a variety of everyday contexts.

Educating students to be better and more informed consumers of information presented in numerical and statistical formats will not come as a result of teaching students of the social studies to work with mathematics and statistics as they apply to history, geography, and economics. Educating students to be better and more informed consumers of information presented in numerical and statistical formats will only come through instruction in and practice with the concepts and skills of social mathematics *as they apply to civics.* National organizations like the NCSS and the CCE, as well as policy makers on the federal and state levels need to understand the importance of social mathematics to an informed citizenry and to a democracy, and need to support the inclusion of social mathematics in the civics curriculum.

Experts who understand, who can articulate, and who can demonstrate the importance of social mathematics to the survival and success of the individual citizen as well as to the survival and success of our representative democracy need to work cooperatively to mount a policy campaign to add social mathematics to civics standards at the national and state levels. Representing this renewed call for social mathematics in the civics curriculum must extend beyond the confines of theoretical articles submitted to national journals and into workshops organized and supported by various professional organizations. Individuals who specialize in the ways in which social mathematics can inform civics and in turn can develop youth who are better prepared to assume the role of citizen need to be willing to make presentations that inspire national and state representatives, school district administrators, teachers, and parents to demand more instruction in social mathematics in the civics classroom.

On a national level, the NCSS and the CCE will need to be encouraged to directly address, using clear and unambiguous language, the concepts and skills of social mathematics as they apply to civics within their content standards. Perhaps NCSS and CCE membership worried about the impact of federal No Child Left Behind legislation on social studies education will seize the opportunity to support the inclusion of social mathematics within civics education. The following example illustrates how direct and unambiguous language that supports instruction in and practice with social mathematics included within the existing NCSS framework of themes of the social studies published within *Curriculum Standards for the Social Studies*. I offer a theoretical eleventh theme entitled *Civic Skills* that might ideally follow the tenth theme published by the NCSS, *Civic Ideals & Practices*. The following description of this hypothetical eleventh stand of the social studies entitled *Civic Skills* developed using the exact format and similar language used by the NCSS to describe the 10 strands of the social studies and is based upon the analysis and findings included within this study:

As American society and the technology and information it produces grows more complex, it is more essential than ever that an understanding of the uses and abuses of mathematics and statistics is an essential part of developing civic competence. In exploring this theme, students confront such questions as: Why is information increasingly represented in numeric and statistical formats? What does the shift to more numeric and statistic forms of information have to do with power? How can social mathematics help document and solve social problems? How can I interpret information or judge and analyze conclusions when the information and conclusions are in quantified formats or represent quantified data? By examining the answers to these and other questions, students develop an appreciation for the ever-increasing role that mathematics and statistics plays in civics and in citizenship. Through studying, learning, and applying the concepts and skills of social mathematics, students learn an entire new set of important and critical civic skills that will help them to work with numerical information and data, to make sense of the world around them, to make better decisions and more informed choices, and to develop into more knowledgeable, capable, and informed citizens.

Learners in the early grades explore how mathematics and statistics are a part of their world. Young learners begin to categorize and classify information and data in numeric form, often using pictures or symbols to represent quantity. In the middle grades, these concepts and skills are applied in more complex contexts with emphasis on new applications. Middle level students are encouraged to make connections between the concepts and skills of social mathematics that inform and are applied in civics, and the concepts and skills of mathematics and statistics that inform and are applied in the other

Table 7.3

<u>Performance Expectations for Civic Skills</u>
Social studies programs should include experiences that provide for the study of how mathematics and statistics, or *social mathematics*, can both inform and be applied to news, information, and data, so the learner can:

Early Grades	*Middle Grades*	*High School*
a. identify, explain, and practice categorizing and classifying information	a. collect and measure data as part of a survey or poll created by the student	a. collect, measure, and draw original conclusions from data as part of an original poll, study, or project
b. recognize and locate numbers embedded in text	b. translate numeric information embedded in the newspaper to verbal and written formats	b. translate verbal or written forms of information embedded into statistical formats
c. identify examples of how numbers can substitute for words	c. analyze and evaluate the use of numbers and statistics in a magazine or newspaper article, or a television news report.	c. Evaluate the quality and effectiveness of statistical evidence used to support a position or policy
d. describe how numbers are used in their classroom, school, home, and community	d. describe how a given set of numerical data can be used to both support and refute a position	d. construct an argument in support and against a position or policy using real and accurate numeric and statistic data
e. describe the role chance plays in flipping a coin	e. Analyze the potential role that chance plays in balloting	e. construct a poll or survey and explain how probability and chance will be minimized
f. examine how average is used to determine grades	f. describe dispersion, mean, median, mode, average tendency, and central tendency	f. identify how dispersion, mean, median, mode, average tendency, and central tendency are used in the media
g. evaluate relative distance between objects or between school, the playground, and home	e. Interpret maps, charts, graphs, diagrams, timelines, etc. that depict mathematical or statistical data	g. Create maps, charts, graphs, diagrams, timelines, etc. that depict social data in mathematical or statistical formats

Table 7.3 (cont.)

Performance Expectations for Civic Skills
Social studies programs should include experiences that provide for the study of how mathematics and statistics, or *social mathematics*, can both inform and be applied to news, information, and data, so the learner can:

Early Grades	*Middle Grades*	*High School*
h. collect data from a sample of classmates	h. collect similar data from small samples and larger samples to identify differences in margins of error	h. Calculate sample size and margin of error in an original poll and study
i. using national poll results, write a paragraph predicting who will win the Presidency	i. make a presentation to the class in which you predict the results of an original poll or survey you develop	i. make a presentation to the class in which you predict the results of an original poll or survey you develop, then make a similar presentation after the results of the data are known that compares the prediction with the actual outcome
j. calculate yearly interest on a savings account	j. identify the highest interest rate of return among semi-annual, quarterly, monthly, and weekly interest	j. identify examples of false promises of rates of return in the newspaper and explain why they are faulty
k. identify the number of students in class it would take to have a majority and a supermajority	k. explain the differences between a majority and a "super majority" within both houses of Congress	k. explain the differences between a majority and a "super majority" within both houses of Congress and analyze the impact of these differences on legislation
l. calculate the ratio of urban versus rural inhabitants of the state	l. explain how the number of representatives sent to Congress is determined	l. draw inferences and conclusions regarding how various geographic regions within your state will vote in upcoming state and national elections
m. develop a personal budget and explain why all "wants" can't be satisfied	m. identify 5 controversial entitlement programs and explain why they are controversial. Use economic evidence to support your position	m. develop a position paper for eliminating a federal program and cite evidence as to why it needs to be eliminated

disciplines of the social studies. High school students develop their abilities to work with social mathematics through a variety of unique projects that the students create, and should be provided multiple opportunities to work and learn alongside of community, political, and business leaders who make use of social mathematics in their personal and professional lives.

Table 7.3 represents the performance expectations aligned with theme eleven, *Civic Skills*. Similar to the description of the theme of *Civic Skills*, the format and language used in Table 7.3 is similar to the format and language used in the performance expectations sections in *Curriculum Standards for the Social Studies*. Content standards suggested for state inclusion could be readily adapted from the performance expectations detailed in Table 7.3. For this to come to fruition, state education associations would need to be educated on the importance of social mathematics to civics education. This process would likely take a "grass roots" campaign similar to the one previously described. All of the representatives – from the leadership of the NCSS to classroom teachers – would need to take an active role in establishing social mathematics within all layers of the curricula of civics.

Similar to the way in which Michael Hartoonian and Bernard Hollister conceptualized the ways in which the concepts and skills of social mathematics could best be introduced to students, textbooks like *Magruder's American Government* could incorporate contemporary "problems" of interest to students. These contemporary problems could be developed into questions that could appear within appropriate chapters as sub-headings: *Given voter turnout of 18 to 21 year-olds since the passage of the 18th Amendment, should the Amendment be repealed? Are alternative fuels including wind,* *solar, and hydrogen fuel cells realistic replacements for fossil fuels? Is America spending enough or too much on defense? Can poll results be trusted? Should I support social security reform as proposed by President Bush, or am I better off under the current plan? Will I really make more money if I go to college? What are some proven ways that I can make my community safe? Do third party candidates really make a difference in elections? Am I just wasting my vote if I vote for a third party candidate? What are the chances that a military draft will return? What affects my chances of getting into the college of my choice? Why does so much money get deducted from my paycheck in taxes? Why is the federal government running such a large budget deficit and what will that mean for my future?*

Using questions and problems like the ones above as a way to introduce students to social mathematics has several advantages over the way social mathematics is currently represented in *Magruder's American Government*. The first advantage is that framing questions and problems around the concepts and skills of social mathematics allows for instruction and practice to be embedded within the text, as opposed to tacked on to the text in the form of charts, graphs, and tables. The second advantage stems from the first – instruction and practice co-exist, thereby reducing the possibility that one or the other might be skipped because they do not fall within the standard text. The third advantage stems from the first two advantages – because instruction and practice co-exist within the standard text and because of this relationship both instruction and practice are more likely to be addressed, it is likely that the quality of this experience will be greater. Students will recall more and be able to recognize and apply the concepts and skills of social mathematics.

The fourth advantage of framing questions and problems around the concepts and skills of social mathematics is that it allows teachers more discretion and flexibility to address social mathematics. Teachers could choose to use different sources of information, choose to use different methods of depicting numeric and statistical data, and choose to address different concepts and skills of social mathematics through allowing their students to develop their answers and solutions to the questions and problems posed. The fifth advantage of framing questions and problems around the concepts and skills of social mathematics is that it allows teachers more discretion and flexibility in choosing how to assess students' abilities to work with social mathematics. Teachers could more easily incorporate all of the levels of the social mathematics rubric (see Table 3.3) if students were assigned to develop their own answers or solutions to questions or problems similar to ones posed in the preceding paragraph.

The sixth advantage of framing questions and problems around the concepts and skills of social mathematics is that those questions and problems can direct students towards using social mathematics in the ways it was intended to be applied by Hartoonian (1989), Paulos (1995) and Steen (1990). Many of the 95 examples in the *Magruder's* text identified as addressing the concepts and skills of social mathematics did so without specifically aligning the concept or skill with the discipline of civics or the actions of citizens. Posing civic questions and problems to students who would in turn need to learn and apply the concepts and skills of social mathematics to answer the question or provide alternatives and solutions seems like it best fulfills Hartoonian's vision for social mathematics.

In addition to using questions and problems as a platform for instruction in, practice with, and discussion about social mathematics, existing examples of social mathematics that appear in *Magruder's American Government* would benefit from restructuring. First, Magruder's needs to address instruction and practice in the concepts and skills of social mathematics in direct and unambiguous language. Second, Magruder's needs to address those concepts and skills of social mathematics within portions of embedded text as opposed to in the current situation where examples of social mathematics appear as "sidebars" to the text. It is simply not reasonable to rely on ancillary portions of the text to provide instruction and practice in social mathematics given that some teachers may not use or assign these charts, graphs, or activities. Third, graphic and visual representations of numeric and statistical information need to be concretely linked with the text surrounding these representations.

A significant deficiency of *Magruder's* treatment of social mathematics is similar to a criticism leveled at contemporary civics texts by Hartoonian, Laughlin, and Sanders almost fifteen years ago (1991) – that graphs and charts were included within textbooks largely because they supported the author's claims. The students were "…the consumers of information rather than the producers of inferences and generalizations" (1991, p. 73). To remedy this, the authors and editors of *Magruder's* need to develop appropriate and meaningful visual and graphic representations of numeric and statistic information that are in turn directly linked to the subject and purpose of the text. References to the graphs, charts, and tables should be made directly within the text and instruction regarding the concepts and skills of social mathematics that students are to apply to those graphs, charts, and tables should be included in the pages preceding each.

The most important recommendation is for *Magruder's* to provide realistic context in which students can learn and practice the concepts and skills of social mathematics. The authors and editors of *Magruder's* should include within the text more opportunities for students to learn of the ways that social mathematics is used in civics. If cleverly crafted, teachers could pair these opportunities with opportunities to practice these social mathematical skills. The discussion of scientific polling in the current edition of *Magruder's* (2004, pp. 218-221), for example, comes fairly close to this ideal. The authors of *Magruder's* provide readers with a fairly comprehensive level of instruction in a variety of social mathematical concepts and skills. In addition, teachers could provide students with a unique opportunity to apply these concepts and skills by developing, administering, and analyzing the results of a poll or survey of their own creation. Unfortunately, this exceptional opportunity came in the form of a *Skills for Life* segment that appeared at the end of the chapter as opposed to a suggestion for an activity or project within the text itself.

To remedy this situation, I suggest that the authors and editors of *Magruder's* use an exercise and format that has been used in many civics classrooms over the years: current events analysis and reporting. Many civics teachers request that students report on current events as part of an overall strategy to teach students the importance of being informed, how to effectively read a newspaper or magazine article, and how to summarize main ideas and report this summary to an audience. The authors and editors of *Magruder's* could embed within the standard *Magruder's* text a URL address that students could access in the classroom, in the school computer laboratory, at home, or in the local library. Accessing this URL address would direct students to a database of current events reporting that directly relates to the topic presented within the text. At several points within each chapter, the URL address and the specific “code” could be printed in a paragraph that follows the description of the problem or issue. The format of this paragraph could be standardized throughout the text so that each paragraph contains the URL address, the correct “code” that corresponds with the topic or issue to be read, important points and evidence that students should look for as they read the article(s), as well as suggested questions students could answer.

For a company as large as Pearson Education, access to well-written articles on topics of current interest should not be problematic. Obtaining permission to reproduce the articles for educational purposes should also not present a problem for Pearson. The URL and the numeric codes that correspond to topics and issues embedded within the *Magruder's* text would not require substantive updating. Pearson Education would need to devote a nominal amount of time and money to maintaining and updating the current events website, but this cost could be offset by either redirecting a portion of internal corporate contributions to non-profit educational programs and services to support the establishment and maintenance of the current events website or by adding a small surcharge to each copy of *Magruder's* sold to school districts.

While every current event entry need not be social mathematical in nature, the editors and authors of *Magruder's American Government* could use the current events website to both establish a relationship between information presented within the text and current opinion and debates that surround the information in question, and to provide students of civics with important instruction and practice in applying civic skills like critical thinking, analyzing and interpreting information, detecting bias, and social mathematics. All of this could be accomplished through students familiarizing themselves with current events – a venue already established and accepted in many civics classrooms across the nation. Additionally, using current events as a platform to explore contemporary and historical civic issues is very much in keeping with the notion of providing context – in this case, current events could provide the context in which skills of social mathematics and critical thinking are applied to "everyday" forms of information.

Suggestions for Further Study

This study successfully addressed the question that guided the analyses undertaken in the previous chapters: *How are the calls for social mathematics represented in the current curricula of civics – national standards, state standards, and a nationally marketed civics textbook?* Similar to many studies, answering this initial question led to the development of others, many that could spawn additional studies: Why is social mathematics represented in the social studies content standards of Texas, but not in the social studies content standards of California and Florida? What role, if any, did NCLB legislation (or a precursor of this legislation) play in the development of those Texas social studies content standards that included social mathematical concepts and skills? How is *Magruder's American Government* used in civics classrooms? How would teachers of civics respond to the suggestion that social mathematics should be included in the civics curriculum? How would teachers of civics respond to the suggestion that *Magruder's* contain embedded exercises devoted to the exploration of current events that provide instruction and practice in the concepts and skills of social mathematics? Would such a strategy be proven effective in terms of developing social mathematical competence in students? What other strategies could be developed that would incorporate instruction and practice with social mathematics into the embedded text of *Magruder's*?

In Summation

After closely reading national, state, and textbook standards and curricula, I concluded that the official curriculum has not addressed systematically the calls for social mathematics in civics education. National standards best imply the importance of social mathematics. States treat social mathematics marginally. Magruder's offers primarily practice and assessment in rudimentary skills of social mathematics. This lack of representation raises important questions about how and if schools across the nation are adequately preparing citizens. I close with a call for an organized campaign to improve the representation of social mathematics in civics education.

If it is indeed accurate – as it was posited in the inception of this work – that information, news, and data are growing increasingly numeric and statistical in format and that those Americans who fail to recognize and understand how numbers and statistics can be both used and abused are at economic, legal, political, and personal risk, then those responsible for shaping and disseminating the official curricula of civics need to consider the recommendations of this study. If there exists a relationship between the health of a democracy and the statistical knowledge of her citizens, it may not be an exaggeration to suggest that the health of our democracy is failing. It might also be said that social mathematics may hold the cure.

References

Alter, G. (1993). Editor's notes. *Social Studies and the Young Learner, 6*(1), 1-7.

Andrews, I.W. (1881, July). The study of political science in colleges. *National Educational Association,* 181-189.

Barnhart, C.L. (1947). *The American college dictionary.* New York: Random House.

Bell, E.T. (1939, June). Mathematics and intelligent citizenship. *London Journal of Education, 71,* 363+.

Best, J.H. (1960, December). Review of the development of the concept of citizenship education since 1900. *High School Journal, 44,* 98-105.

Blough, G.O. (1956). Science and social studies in today's elementary school. In H.H. Cummings (Ed.), *Science and the social studies* (pp. 187-199). Washington, DC: NCSS.

Boozer, H.R. (1960). *The American Historical Association and the schools, 1884-1956.* Unpublished doctoral dissertation, Washington University: Seattle, WA.

Brown, R. (1934, January). Mathematical difficulties of students of educational statistics. *Teachers College Record, 35,* 327-8.

Bullock, C.J. (1891, May). Political economy in the secondary school. *Education, VII,* 539-545.

Burchill, W.E. (1891, October). Political economy in schools. *Education, 12,* 91-95.

Butler, N.M. (1909). The call to citizenship. *National Education Association, 47,* 75-82.

Center for Civic Education. (1994). *National standards for civics and government.* Calabasas, CA: Center for Civic Education.

Clark, J.B. (1889, February). Preparation for citizenship III. *Education, 9,* 403-6.

Cockcroft, W.H. (1982). *Mathematics counts.* London: Her Majesty's Stationery Office.

Cohen, P. (1999). *A calculating people: The spread of numeracy in early America.* New York: Routledge.

Cohen, P. (2001). The emergence of numeracy. In L.A. Steen (Ed.), *Mathematics and democracy: The case for quantitative literacy* (pp. 23-30). New York: Woodrow Wilson National Fellowship Foundation.

Cohen, P. (2003). Democracy and the numerate citizen: Quantitative literacy in historical perspective. In B.L. Madison & L.A. Steen (Eds.), *Quantitative literacy* (pp. 7-20). Princeton, NJ: National Council on Education and the Disciplines.

Condliffe Lagemann, E. (2000). *An elusive science: The troubling history of education research.* The University of Chicago Press: Chicago, IL.

Coman, K. (1890, February). Preparation for citizenship. *Education, X*(6), 341-347.

Crehore, C.F. (1866, December). The teaching of civics in the schools. *Education, 7,* 264-5.

Ellis, E. (Ed.). (1937). *Education against propaganda: Seventh yearbook of the NCSS.* Washington, DC: NCSS.

Ellis, E. (1942). Methods and materials for developing skill in critical thinking. In H. Anderson (Ed.), *Teaching critical thinking in the social studies: NCSS yearbook* (pp. 49-92). Washington, DC: NCSS.

Engle, S. (1960, November). Decision making: Heart of the social studies. *Social Education, XXIV(7),* 301-4 & 306.

Evans, H. & Crary, R.W. (1951). The citizen as problem solver. In Crary, R.W. (Ed.), *Education for democratic citizenship* (pp. 27-36). Washington, DC: NCSS.

Fawcett, H.P. (1947, May). Mathematics for responsible citizenship. *Mathematics Teacher, 40,* 199-205.

Fisher, R.A. (1925). *Statistical methods for research workers.* Edinburgh, London: Oliver & Boyd.

Fisher, R.A. (1935). *The design of experiments.* Edinburgh, London: Oliver & Boyd.

Florida Department of Education. (1999). *Sunshine State Standards.* Retrieved August 3, 2004 from http://www.firn.edu/doe/curric/prek12/frame2/htm

Flynn, S. (1953, October). Mathematical thinking for intelligent citizenship. *Catholic School Journal, 53,* 252.

Forman, S.L. & Steen, L.A. (1999*). Beyond eighth grade: Functional mathematics for life and work.* Berkeley, CA: National Center for Research in Vocational Education.

Gal, I. (1997). Numeracy: Imperatives of a forgotten goal. In L.A. Steen (Ed.), *Why numbers count* (pp. 36-44). New York: The College Board.

Geography Education Standards Project. (1994). *Geography for life: National geography standards.* Washington, DC: National Geographic Research and Exploration.

Goodrich, M.T. (1933, April). Should math teachers seek to know the needs of society. *Mathematics Teacher, 26,* 241-2.

Guest, H.W. (1928, February). Education for citizenship. *Education, 28,* 344-8.

Haefner, J.H. & Cummings, H.H. (1956). A look ahead. In H.H. Cummings (Ed.), *Science and the social studies* (pp. 246-256). Washington, DC: NCSS.

Halter, H. & Bill, G. (1933, October). Social science and mathematics get together. *Junior/Senior High School Clearing House, 8,* 110-6.

Hannelly, R.J. (1941, November). Democracy and mathematics. *Education Forum, 6,* 65-7.

Harley, W.S. (1892, September). Education for citizenship. *Education, 13,* 16-19.

Hart, A. (1888, June). Preparation for citizenship I. *Education, 8,* 630-639.

Hartoonian, H.M. (1989). Social mathematics. In M. A. Laughlin, H.M. Hartoonian, & N.M. Sanders (Eds.), *From information to decision making* (pp. 51-64). Washington, D.C.: NCSS.

Hartoonian, H.M. (1992, July/August). The social studies and project 2061: An opportunity for harmony. *The Social Studies,* 160-163.

Hartoonian, H.M., & Laughlin, M.G. (1997). *Challenges of social studies instruction in middle and secondary schools: Developing enlightened citizens.* New York: Harcourt, Brace.

Hartoonian, H.M., Laughlin, M. & Sanders, N. (1991). The case for social mathematics (statistics) in social studies education. In J. L. Barth, et. al. (Eds.), *Thinking about the social studies: Some specific ideas about the discipline* (pp. 73-85). Washington, DC: NCSS.

Heiges, R.E. (1939, March). What may social studies expect from mathematics? *Pennsylvania School Journal, 87,* 233-4.

Hellmich, E.W. (1937, December). Mathematics in certain elementary social studies in secondary schools and colleges. *Teachers College Record, 39,* 244-5.

Hertzberg, H.W. (1981). *Social studies reference 1990-1980.* Boulder, CO: Social Science Education Consortium.

History-Social Science Curriculum Framework and Criteria Committee. (2001). *History-Social Science Framework for California Public Schools.* Sacramento, CA: California Department of Education.

Hollister, B.C. (1995, January). Social math in the history classroom. *Social Education, 59*(1), 14-6.

Hunsaker, A.F. (1912, December). Civics in the secondary school. *Education, 33,* 228-37.

Hyman, H.H. & Sheatsley, P.B. (1950). Current status of American public opinion. In J.C. Payne (Ed.), *The teaching of contemporary affairs* (pp. 11-34). Washington, DC: NCSS.

Jennings, M. (1956). Teacher education. In H.H. Cummings (Ed.), *Science and the social studies* (pp. 12-245). Washington, DC: NCSS.

Jones, R. (2002). Textbook troubles. *American School Board Journal, 12,* 1-8.

Kennedy, D. (2001). The emperor's vanishing clothes. In L.A. Steen (Ed.), *Mathematics and democracy: The case for quantitative literacy* (pp. 55-9). New York: Woodrow Wilson National Fellowship Foundation.

Kliebard, H.M. (1995). *The struggle for the American curriculum.* New York: Routledge.

Kliebard, H. M. (Ed.) (2002). *Changing course: American curriculum reform in the 20th century.* New York: Teachers College Press.

Kliebard, H.M. & Wegner, G. (2002). Harold Rugg and the reconstruction of the social studies curriculum: The treatment of the "Great War" in his textbook series. In H. M. Kliebard (Ed.), *Changing course: American curriculum reform in the 20th century* (pp. 61-75). New York: Teachers College Press.

Koch, A. & Peden, W. (1998). *The life and selected writings of Thomas Jefferson.* New York: Random House.

Levin, S.M. (1923, September). Recent tendencies in the teaching of the social sciences in the secondary schools. *Education, 44,* 1-14.

MacKibbin, S. (1890, March). Preparation for citizenship in Michigan. *Education, X*(7), 405-413.

Marcham, F. G. (1942). Nature and purpose of critical thinking. In H. Anderson (Ed.), *Teaching critical thinking in the social studies: NCSS yearbook* (pp. 1-48). Washington, DC: NCSS.

Maynard, P.W. (1940, January). Use of local statistics in high school courses in sociology and social problems. *Social Studies, 31,* 32+.

McClenaghan, W.A. (2004). *Magruder's American Government.* Needham, MA: Pearson.

Meehan, C. (1954, April). Mathematics and the development of good citizens. *Mathematics Teacher, 47,* 226-30.

Missimer, H.C. (1889, November). The high school and the citizen. *National Educational Association,* 507-21.

Moe, G.A. (1934, December). How to correlate mathematics and history. *Minnesota Journal of Education, 15,* 144-5.

Morse, A.D. (1888, December). Preparation for citizenship II. *Education, 9,* 236-46.

Moses, R.P. & Cobb Jr., C.E. (2001). *Radical equations: Civil rights from Mississippi to the algebra project.* Boston, MA: Beacon Press.

Mossman, E.L. (1947, December). Mathematical concepts through social studies. *California Journal of Secondary Education, 22,* 473-6.

Mowry, L. (1887, October). Courses of study in civics for schools and higher institutions of learning. *Education, 8,* 85-94.

Murphy, J.F. (1936). Student survey of local occupations. *Social Studies, 27,* 474-6.

National Center for History in the Schools. (1996). *National standards for history: Basic edition.* Los Angeles, CA: National Center for History in the Schools (UCLA).

National Council for the Social Studies. (1994). *Expectations of excellence: Curriculum standards for the social studies.* Washington, DC: NCSS.

National Council on Economic Education. (1997). *Voluntary national content standards in economics.* New York, NY: National Council on Economic Education.

Orrill, R. (2001). Foreword. In L.A. Steen (Ed.), *Mathematics and democracy: The case for quantitative literacy* (pp. xiii-xx). New York: Woodrow Wilson National Fellowship Foundation.

Page, M. (1992). *National history day: An ethnohistorical case study.* Unpublished doctoral dissertation, University of Massachusetts, Boston, MA.

Paulos, J. (1988). *Innumeracy: Mathematical illiteracy and its consequences.* New York: Hill and Wang.

Paulos, J. (1991). *Beyond numeracy: Ruminations of a numbers man.* New York, NJ: Alfred A. Knopf.

Paulos, J. (1995). *A mathematician reads the newspaper.* New York: Basic Books.

Perry, A. (1889, April). Preparation for citizenship IV. *Education, 9,* 513-520.

Porter, T. (1997). The triumph of numbers: Civic implications of quantitative literacy. In L.A. Steen (Ed.), *Why numbers count: Quantitative literacy for tomorrow's America* (pp. 1-10). New York: College Entrance Examination Board.

Prendergast, E.M. (1933, January). Mathematics and social science. *Mathematics Teacher, 26,* 33-9.

Rorer, J.T. (1934, February). Social qualities of mathematics. *Mathematics Teacher, 27,* 82-5.

Rosander, A.C. (1936, October). Mathematical analysis in the social sciences. *Mathematics Teacher, 29,* 289-94.

Rosander, A.C. (1936, February). Quantitative thinking on the secondary school level. *Mathematics Teacher, 29,* 61-66.

Rosander, A.C. (1937, July). Experimental course in quantitative thinking. *School Review, 45,* 337-45.

Rugg, H.O. (Ed.). (1923). *Do the social studies prepare pupils adequately for life activities? The twenty-second yearbook of the national society for study of education, Part II, (Chapter I).* Michigan: Univ of Michigan Press.

Scates, D.E. (1943, February). Statistics: The mathematics for social problems. *Mathematics Teacher, 36,* 68-78.

Schoenfeld, A.H. (2001). Reflections on an impoverished education. In L.A. Steen (Ed.), *Mathematics and democracy: The case for quantitative literacy* (pp. 49-54). New York: Woodrow Wilson National Fellowship Foundation.

Shaver, J.P. (1996). NCSS & citizenship education. In O.L. Davis, Jr. (Ed.), *NCSS in retrospect* (pp. 35-43). Washington, DC: NCSS.

Smith, D.E. (1967, February). Mathematics in the training for citizenship. *Mathematics Teacher, 60,* 140-8.

Steen, L.A. (1990, Spring). Numeracy. *Daedalus, 119*(2), 211-231.

Steen, L.A. (1990). *On the shoulders of giants: New approaches to numeracy.* Washington, DC: National Research Council.

Steen, L.A. (1997). *Why numbers count: Quantitative literacy for tomorrow's America*. New York: College Entrance Examination Board.

Steen, L.A. (2001). *Mathematics and democracy: The case for quantitative literacy.* New York: Woodrow Wilson National Fellowship Foundation.

Stutz, F.H., Fulkerson, W.K., Helmer, A.M., & Stoutenburg, J.E. (1953). Interpreting data in graphic form. In H.M. Carpenter (Ed.), *Skills in social studies* (pp. 178-195). Washington, DC: NCSS.

Texas Education Agency. (2003). *Texas Essential Knowledge and Skills.* Retrieved February 22, 2005 from http://www.tea.state.tx.us/teks/index.html.

Todd, E.S. (1912, March). An economic basis for civics teaching. *Education, 32,* 436-44.

Vose, J.E. (1887, May). Methods of instruction in civics III. *Education, 7,* 17-27.

Walker, H.M. (1931, April). Democracy and the statistical method. *Teachers College Record, 32,* 599-607.

Walker, R. (2002). America's best-selling civics textbook: Poll-tested and super-sized. *Slate,* 1-2. Retrieved July 2, 2004 from http://slate.msn.com/id/2070583/

Welling, R.W.G. (1903). The teaching of civics and good citizenship in the public schools. *National Education Association, 42,* 98-102.

Wesley, E. (1941). Nature and functions of the social studies. In W. Young (Ed.), *The social studies in the elementary school: NCSS yearbook* (pp. 47-56). Washington, DC: NCSS.

Wrightstone, J. (1941). Evaluating a specific situation. In W. Young (Ed.), *The social studies in the elementary school: NCSS yearbook* (pp. 230-243). Washington, DC: NCSS.

Zaslavsky, C. (1979). *Africa counts: Number and pattern in African culture.* Westport, CT: Laurence Hill & Co.

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2005	*The Unique Log Architecture of Central Pennsylvania*. Early American Life. February, 2005. Pages 48-53.
2004	*New Ways of Looking at Old Things: One Case That Combines Mathematics and American History Through a Primary Source of Information*, with Dr. Elizabeth Mauch. Convergence, The Online Magazine of the Mathematical Association of America.
2003	*Sunbury Artist George Bucher*. Susquehanna Life. Summer, 2003. Pages 26-27, 39.
2002	*Eric Sloane; Anthropologist of Early America.* Early American Life. Vol. XXXIII No. 5, October 2002. Pages 35-38, 66-67.
2001	Aware: A Retrospective of the Life and Work of Eric Sloane, published by Garrigues House Publishers, 2001. An expansive biography of the career of artist and author Eric Sloane.
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