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INVESTIGATING PRESIDENTIAL DATA TO CONNECT MATH AND SOCIAL STUDIES

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Investigating Presidential Data to Connect Math and Social Studies

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Abstract

The purpose of this paper is to highlight benefits of integrating math and social studies content. The relevancy of a math lesson is increased by integrating thought-provoking social studies data such as the ages of U.S. presidents at their death. Connecting data analysis with factors pertaining to history and life expectancy provides meaning to both math and history concepts. *Keywords:* mathematics, social studies, integrated curriculum, interdisciplinary connections, historical data, real-life problem solving

Introduction

When will I ever need this in “real life?” Stem and leaf sounds like some kind of flower, not a data analysis tool. President who? What does this have to do with my life?

Mathematics and social studies occur together in life. From interpreting graphs and statistics through current events to using and analyzing historical data, math and social studies are natural companions. Understanding the ebbs and flows of the economy, orienting and interpreting maps, and plotting population shifts require skills from both disciplines. This natural

integration of math and social studies is evident in and through the interdependent structure of society. Teachers could make both content areas more relevant and meaningful for students by viewing them—and teaching them—this way.

All aspects of life are inherently interwoven. Given this, it stands to reason that an integrated curriculum is best practice for educating students (Campbell, Mumpire, & White, 2000). Historically, educators such as John Dewey, Howard Gardener, and Benjamin Bloom have emphasized the value of contextual learning. An integrated curriculum can provide students meaningful opportunities to connect learning in and out of school (Beane, 1997; Vars, 2001). Integration promotes the relevance of classroom learning by making the curriculum more meaningful to students' lives (Hargreaves & Moore, 2000). An integrated curriculum has several important goals or objectives, namely to establish the connections between different subject areas, to develop the ability to think openly and critically, to enhance problem-solving skills, and to encourage students to view themselves as a part of a larger picture/bigger community (Stevenson & Bishop, 2012; Campbell et al., 2000; Caine & Caine, 1991).

With some effort and planning, teachers can bring multi-disciplinary connections to the forefront by utilizing real-life applications with cultural relevancy in current and historical data. Social studies naturally lends itself as the unifying theme for interdisciplinary planning (Senn, Coleman, & McMurtrie, 2010). By doing their best to connect content areas, teachers can help students see mathematics, social studies, and other disciplines as “permeating life and not just existing in isolation” (National Council of Teachers of Mathematics, 2000, p. 279). As Hinde (2005) reminds us, “When teachers are knowledgeable about content areas and integrate them effectively, students' achievement increases” (p. 108). Integration of content areas offers an

opportunity for rich, relevant teaching and learning. It affords teachers and students alike opportunities to engage with the content in creative, purposeful, and relevant ways.

Connections Between Content Areas

Just as math is more than memorizing facts and formulas, social studies is much more than defining words, listing dates, and labeling maps. In our world of access to massive amounts of ever-changing information, our students need to be critical thinkers who can interpret, analyze, and evaluate information. Students learn best when they are actively engaged in the learning process and asked to make connections between the content we teach and the lives they lead. As students learn mathematics, they too learn about citizenship, government, map skills, geography, history, economics, family, and community—all core components of social studies. Interdisciplinary connections—particularly with social studies—can help students recognize the power of mathematics as an essential analytical tool in understanding and interpreting their world.

With a little extra effort and planning, what may seem daunting can ultimately prove beneficial to enhancing student interest in and understanding of the content. Integrative curriculum “helps students make sense of their lives and the world around them” (NMSA, 2010, p. 21) and opens their eyes to “the rich and inherently interdisciplinary world in which they live” (Stevenson & Bishop, 2012, p. 37). The Association for Middle Level Education (AMLE)’s *This We Believe* (2010) states that curriculum must be challenging, exploratory, integrative, rigorous, and relevant. Learning should not occur in isolation.

Integrative teaching is viewed as one of the best ways to maximize student learning. Venville, Sheffield, and Rennie (2008) define integrative curriculum as “the purposeful planning, by teachers, of strategies and learning experiences to facilitate and enhance learning across key

learning areas . . . [as well as] the demonstration, by students, of knowledge and understandings, skills, and values and attitudes that transcend individual key learning areas” (p. 859). An integrated or interdisciplinary curriculum allows for varied instructional approaches that recognize and accommodate differences in student learning. We teach more effectively when we move beyond basic coverage of isolated skills and plan for, through cross-disciplinary integration, meaningful and creative student exploration.

Both the National Council of Teachers of Mathematics (NCTM, 2000) and the National Council for the Social Studies (NCSS, 2010) standards support curriculum integration. NCTM (2000) urges math teachers to “enhance students’ understanding of mathematics by using other disciplines as sources of problem solving” (p. 278). Applying mathematics to other subject areas helps students see where mathematics fits into the world at large. To address this, NCTM promotes five process standards: problem solving, communication, connections, reasoning and proof, and representation. The key to mathematical competence is learning with understanding so that students are able to reason, solve problems, and apply their learning to new situations. To reach this end, students can use social studies to deepen their understanding(s) of mathematics.

The National Council for the Social Studies (NCSS) (2010) defines social studies as the integrated study of the social sciences and 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” (p. 3).

When trying to implement math topics in ways that are relevant to students, integrating social studies is a perfect avenue. Social issues provide a context for connecting mathematics to

students' lives. Real-life applications give students opportunities in using tools to integrate math into their everyday lives—a skill that will prove extremely valuable in the future. Emphasizing the value of connections, NCTM (2000) promotes providing students with opportunities to experience mathematics in context. Such connections can also be found in situations arising from social studies, the sciences, the social sciences, medicine, and commerce. Connecting content to other disciplines promotes relevancy and meaning. In turn, mathematics skills enable accurate investigation of social studies topics.

Though both the math and social studies content areas share numerous interdisciplinary opportunities, they also share many of the same student lamentations: “Why are we learning this?” “When will we ever use this?” “What does this have to do with me?” Students perceive both mathematics and social studies as information and procedures to be memorized, not necessarily to be understood and applied. With purposeful integration, teachers can shift the way students approach mathematics and social studies. The learning that takes place in the classroom should mirror the world outside of the classroom. In real-world situations, we rarely stop to recognize which “subjects” apply (Beane, 1993). We use the knowledge and skills acquired through multiple subjects and in multiple contexts to understand, interpret, and respond to our world. Similarly, integrating mathematics and social studies allows for such meaningful connections to be made.

Using Data to Connect Math and Social Studies

Data is all around us. With access to the Internet, information is simply a click away. To be able to make reasoned, informed decisions, students need to be able to both analyze and interpret data. A working knowledge of number sense and statistics is a necessary part of informed, participatory citizenship. Numeracy is a perfect example of the link between math and

social studies. Authentic problem-solving opportunities abound with the use of historical and current data. Crowe (2010) highlights four areas of numeracy skills that teachers can seamlessly integrate with social studies: raw numeric data in context, percentages in context, understanding averages, and analyzing graphs and charts. A solid understanding of economic issues requires both social studies and math skills. For example, trying to comprehend the United States' national debt requires number sense!

Social studies and mathematics are part of our everyday lives, not just random, non-contextualized facts to memorize. The goal is to forge real-world and relevant connections between both subjects. Social studies teachers can provide opportunities for students to analyze data from historical events, thus affording deeper, more complex understandings. Whenever possible, teachers should utilize current and historical data and graphs in the classroom setting. Additionally, students can conduct research to investigate lines of inquiry and create their own charts, tables, and graphs.

Data is a bridge connecting mathematics and social studies. Posing a question in the context of historical data gives meaning to learning data analysis in an authentic manner. For example, investigating the question, "What is the average life expectancy of U.S. presidents?" requires information from both math and social studies content. The relevancy of a math lesson is enhanced by integrating thought-provoking social studies data. The precision of the examination of the historical data is strengthened with the use of appropriate statistical techniques. Thus, connecting data analysis with factors pertaining to history and life expectancy brings deeper meaning to both the math and history concepts.

Analyzing U.S. presidential data offers an opportunity for students to connect math and social studies utilizing a historical data set (see Table 1). While investigating the ages of U.S.

presidents at death, students can use statistical methods to analyze the data, construct a stem-and-leaf plot, interpret a box-and-whiskers plot, and calculate measures of central tendency. As students calculate statistics and graph the data, they also consider questions such as the following:

- How many presidents died in their 40s or 50s?
- Who was the youngest to die? Which president lived to be the oldest?
- Identify the four presidents who were assassinated. How do these data points impact the data set?
- Construct a stem and leaf plot. Describe the distribution of the data.
- Describe the data using the measures of central tendency – mean, median, and mode.
How do these measures relate to the shape of the distribution of the data in the stem-and-leaf plot?
- Construct a box-and-whiskers plot representing the data set. Analyze the plot. Discuss quartiles, the spread of the data, as well as gaps and clusters.

In the discussion of the data, students can look for trends in life expectancy and consider historical contexts. Students can investigate facts about U.S. presidents, leadership, and government. For example, we can enhance the discussion of the findings from the data regarding the longevity of life for U.S. presidents by incorporating the eligibility requirements for presidential candidates. An important part of the discussion is the minimum age requirement. An examination of presidents' ages at inauguration would be another relevant research topic. The U.S. Constitution also requires that the President be born in one of the fifty states. A related task could be for students to research where each president was born, create a map, and graph the data.

Table 1. Ages of U.S. Presidents at Their Death

Ages of U.S. Presidents at Their Death

The table below lists the presidents of the United States and the ages at which they died.

Washington	67	Pierce	64	Wilson	67
Adams	90	Buchanan	77	Harding	57
Jefferson	83	Lincoln	56	Coolidge	60
Madison	85	Johnson	66	Hoover	90
Monroe	73	Grant	63	Roosevelt	63
Adams	80	Hayes	70	Truman	88
Jackson	78	Garfield	49	Eisenhower	78
Van Buren	79	Arthur	57	Kennedy	46
Harrison	68	Cleveland	71	Johnson	64
Tyler	71	Harrison	67	Nixon	81
Polk	53	McKinley	58	Ford	93
Taylor	65	Roosevelt	60	Reagan	93
Fillmore	74	Taft	72		

Other Data Sources for Statistics Connecting Disciplines

Good questions can lead to more questions. As teachers and students investigate presidential data and average life expectancy, students’ natural curiosity will stimulate additional questions. Teachers can prompt critical thinking by challenging students to generate additional questions as they examine data. For example, do U.S. presidents live longer than other Americans? What variables and factors should be considered? What is the average life expectancy in the United States and how has that changed over time? How does the average differ among various subgroups? What is the life expectancy in other countries? What is the average age of a US president? How many former presidents are still living? What potential do their ages have to affect the current data trend? Data from sources listed in Table 2 can be analyzed using both mathematics and social studies skills.

Table 2. Websites for Data and Statistics

Topic	URL
Presidents, V.P.s, & First Ladies of the USA	https://www.usa.gov/presidents
USA Government Statistics	https://www.usa.gov/statistics
Life Expectancy by Country (2015)	http://www.infoplease.com/world/statistics/life-expectancy-country.html
U.S. Life Expectancy at Birth by Race & Gender (1930-2010)	http://www.infoplease.com/ipa/A0005148.html
U.S. Census Bureau Data	http://www.census.gov/
Aviation Data	https://www.faa.gov/data_research/aviation_data_statistics/
Centers for Disease Control and Prevention	http://www.cdc.gov/datastatistics/
State Facts	http://www.ers.usda.gov/data-products/state-fact-sheets.aspx
U.S. Department of Agriculture Fact Book	www.usda.gov/factbook
National Center for Educational Statistics	http://nces.ed.gov
The American Revolution	http://theamericanrevolution.org/
The War of 1812	http://www.theuswarof1812.org/
The U.S. Civil War	http://www.theuscivilwar.org/

Conclusion

The opportunity to learn social studies and mathematics together in applicable ways makes the information come alive for students. Teachers can integrate the disciplines of mathematics and social studies in meaningful ways that will allow their students to see the relevancy of both subjects to their lives.

Though students may not always perceive mathematics and social studies in the best light, there are ways that teachers can create integrated lessons that make math and social studies relevant, engaging, and fun. Integrating mathematics and social studies promotes a deeper understanding of both content and context. Social studies content provides a rich context for many math concepts. In turn, math provides an avenue through which to thoroughly examine

social studies content. The more teachers explore this relationship, the more seamless connections they can make. Look around. Math and social studies are everywhere!

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