In Defense of the Social Studies: Social Studies Programs in STEM Education

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Understanding social studies programs at science, technology, mathematics and engineering (STEM) schools is becoming increasingly important as the number of STEM schools grows. This study undertook a qualitative investigation into social studies programs at two STEM high schools. Interviews from social studies teachers, principals, and students were transcribed, coded, and analyzed. Additional data was collected through observation and document analysis. Findings highlighted social studies teachers' perceptions that a strong social studies curriculum is essential to STEM education; the opportunities of interdisciplinary and technology integration afforded to social studies STEM teachers; and some of the challenges of teaching social studies in a STEM school. The researcher discusses the implications of these findings for stakeholders in the social studies to ensure citizens are equipped with the needed skill, knowledge, and dispositions to compete in a global and multicultural age.

Keywords: science, technology, engineering, mathematics, STEM education, marginalization, social studies

Introduction

According to the National Council for the Social Studies (NCSS), and the latest research in social studies education, the last decade of the 20th Century and the first decade of the 21st century have seen a marginalization of the social studies curriculum, instruction, and assessment at all grade levels (Bolick, Adams, & Wilcox, 2010; Pace, 2007). This quiet storm in social studies education has resulted in the reduction of instructional time, resources, and rank from the curriculum (Pace). As funding and investments in social studies education have grown scarce, there have been increased calls by national and state governments to drastically increase funding for science, technology, engineering, and mathematics (STEM) education (Obama, 2007). As the STEM movement grows, more research is needed that investigates the role of the social studies in STEM schools. The purpose of this study was to better understand social studies programs housed at two STEM schools. It is my hope that this study will advance a line of inquiry that examines the challenges and opportunities for the social studies and its teachers in STEM schools. I begin by couching my conceptual framework in two key areas: STEM education, and social studies and citizenship education.

Conceptual Framework and Literature Review

STEM Education

On October 4th, 1957, the Soviet Union launched Sputnik into space. With the Soviets winning the initial race to place a satellite in outer-space, and mounting criticism over the American education system, a massive wave of government involvement ensued to heighten

the academic rigor of the American curriculum, especially, in mathematics and science. In the midst of a Cold War, policy makers acted swiftly to reform American schools. These bold reforms were topped off by Congress passing the 1958 *National Defense of Education Act* to counteract the Soviet's ability to educate young scientists and mathematicians (Passow, 1957). This U.S. act provided over 4 billion dollars, over 4 years, in order to prepare highly qualified professionals in the STEM fields (Fleming, 1960). In particular, Title III of NDEA provided millions of dollars for states to strengthen their mathematics, science, and foreign language curriculum and instruction (Jolly, 2009). The fear of global nuclear war, pitting democratic and free market regions versus Communist regions, brought about a massive call to bolster the academic rigor and opportunities students have in mathematics, science, engineering, and foreign language. The call for a stronger, more robust curriculum, especially in mathematics and science, would be echoed in the 1983 report *A Nation at Risk* (NCEE, 1983).

Over 50 years after the launch of Sputnik, Americans are still demanding a stronger mathematics and science curriculum in the United States to stay economically competitive in a global age. Year after year, students in the United States score towards the middle of the pack in international comparisons of mathematics and science scores when compared with other students in industrialized societies (Baldi, Jin, Skemer, Green, & Herget, 2007). The latest results from the National Assessment of Educational Progress ([NAEP, 2011]) reveal many national areas of concern with student performance in sciences. Less than 40% of all 4th grade students who take the NAEP are proficient in mathematics, and less than 30% are proficient in science (Baldi). Amongst twelfth graders, students' performance on the mathematics and science NAEP tests is stagnant (Baldi). With mounting international competition for STEM related jobs, federal, state, and local authorities are doubling their commitments to strengthen student preparation and recruitment in STEM areas (Editors, 2008).

At the forefront of this movement to keep the United States economically competitive in the STEM areas is a plan to bolster STEM education. STEM education utilizes a curriculum design and philosophy that emphasizes the integration of the hard sciences, namely, the biological and physical sciences, mathematics, engineering, and technology, for students to solve real world problems (OSLN). These 'hard' sciences focus more on empirical data, objectivity, and the scientific method than the 'soft' sciences (OSLN). An important call for bolstering STEM education came in the 2007 *Rising Above the Gathering Storm Report* by the National Academy of Science (National Academy of Sciences, 2007). The report outlined the importance of increasing America's talent pool by improving STEM education and teacher quality. Since this report's release, there has been a huge investment of time, money, and policy in STEM education. The goal is that the STEM high school graduate is motivated and capable of successfully completing a college-level course of study in science, technology, engineering, and mathematics without the need for remediation (OSLN). Furthermore, STEM education emphasizes the importance of post-secondary options and internships for high school students. Thus, there has been growing collaboration between STEM high schools, colleges and universities, and the private sector (Battelle, 2009).

Social Studies and Citizenship Education

While there has been a national movement to strengthen STEM education (Obama, 2010), The National Council for the Social Studies, and the latest research in social studies education, have cited the marginalization of the social studies curriculum, instruction, and assessments at all grade levels (Pace, 2007). The field often has come under attack from high stakes tests that either fail to test the social studies, resulting in its emphasis being reduced, and an all too common practice of its teachers using didactic forms of instruction to produce short-term student gains on high stakes tests (Grant, 2001; Loewen, 2010).

A social studies education is essential to civic competence and the maintenance and enhancement of a free and democratic society (NCSS, 2008). In a time where the United States is engaged in two wars, an economic crisis, and critical political debates over the future of the nation, many social studies practitioners see the social studies as being unjustifiably marginalized. A noteworthy indicator of this conclusion is that – when surveyed by the Center on Education Policy – 33% of U.S. school districts reduced instructional time for social studies "somewhat or to a great extent" (Center on Education Policy, 2006). While media reports often portray the dismal performance of American students in mathematics and science, social studies educators are quick to reference student lackluster scores in civics, economics, government, and history. The 2000 *IEA Civic Education Study*, where over 90,000 fourteen year olds in twenty-six countries were surveyed on their civic knowledge, found that civic knowledge was a major predictor of intention to vote (Torney-Purta et al, 2001). Those individuals that followed and understood the political process felt more comfortable expressing themselves on Election Day. This research study fueled a call by the social studies community to strengthen instructional time, assessments, and resources in preparing citizens readying and willing to vote. Social studies educators often note that, currently, less than one-third of Americans aged 18-24 vote, and young people often cite their lack of civic understanding and distrust of the current political system as major reasons for not voting (Levin & Wichowsky, 4-15-2008). As a major mechanism in helping students gain civic knowledge and an understanding/belief in the democratic system, social studies educators note how the marginalization of the social studies in America's schools threaten the health and prosperity of American democracy.

Methodology

The purpose of this study was to better understand social studies programs housed at two STEM schools. In order to learn about the social studies programs at these STEM schools, I enlisted a qualitative approach (Guba & Lincoln, 2005). Grounded theory was used as it seeks to generate theory from categories that emerged. Comparison of data from emerging categories, and an attentive eye towards relationships and discrepancies, is the hallmark of grounded theory (Creswell, 2009). Since this area of social studies programming in STEM schools is under researched and theorized, grounded theory was a proper method of inquiry for this exploratory study.

The essential questions for this qualitative study included: What were social studies teachers' perceptions of teaching social studies at STEM high schools? And, what were the opportunities and challenges in teaching social studies at these two STEM high schools? These questions were largely dependent upon interview data from teachers, students, and schools'

principal. Classroom observation and document analysis of such documents as lesson plans, courses of study, and student work served as other means of data collection.

Participants and Sites

Two STEM college preparatory high schools located in urban centers in the Midwestern United States were selected. These two will be referred to as STEM Academy and High Tech High. Both schools are situated in low-income communities with a long, rich history of manufacturing and automobile production. While many different variations of STEM schools exist (schools within-a-school, converted schools, etc.), this study investigated two schools constructed and currently operating as start-up public STEM Schools. Though receiving considerable corporate funding and sponsorship, these two schools are not charter schools but 'innovative' schools connected to their local school systems. The STEM Academy has been around since fall of 2006, and High Tech High was established in the summer of 2008. Although open to all students, students at both schools are required to pass state graduation exams, with the results reported to the public annually by the state's Board of Education. Since student demand almost always outnumbers available open slots, applicants' names are entered into a lottery where all students have the same chance of being selected. This lottery process reflects the system most STEM schools employ when demand for enrollment is greater than available supplied spots (OSLN, 2010). The schools were selected through purposeful sampling predicated on the investigator selecting information rich participants from whom to gain deeper insights and understandings (Patton, 1990). Purposeful sampling provided a means to recruit participants with a deep understanding of social studies programs at these two STEM schools.

Table 1
Number of Students and Teachers (2006-2011)

Year	Number of Students		Number of Teachers Positions	
	STEM Academy	High Tech High	STEM Academy	High Tech High
2006-07	98	x	6	x
2007-08	200	x	12	x
2008-09	298	100	18	7
2009-10	396	195	24	12
2010-11	400	299	24	18

The research literature was used to establish relevant and aligned participant selection criteria. LeCompte and Preissle-Goetz (1994) advise researchers to create a list of attributes essential to the selected population and then "…proceed to find or locate a unit matching the list (p. 70)." These established criteria helped me identify and locate information rich cases. Through purposeful sampling, I recruited two social studies teacher participants (one at each school) and six students (three at each school). The teacher participants were selected based on the following criteria:

1. Is currently teaching high school social studies at a STEM School.
2. Has taught high school social studies at a STEM high school for at least three years.
3. Has provided informed consent, and has the ability to allocate the needed time and effort for the study

Student participants were recommended for the study by their teachers based upon fixed criteria. While teachers provided recommendations, I made the final decision. Each teacher recommended twelve possible students, for a total of 24. The recommended students underwent a screening process in order to select the final three participants at each school. The screening process centered on their performance during a preliminary conversation in regards to four important criteria:

- Inclusion of students from diverse environments who are enrolled in a selected teacher's STEM high school social studies classroom.
- Recommendation by a participating teacher.
- Provision of students informed assent and a parent's informed consent to participant in the study.
- Willingness to put forth the required time and effort to participate in the study.

Outside of selecting student and teacher participants for this study, each school's building principal was also selected for an interview. The interview of the school's principal helped to add administrative insights into the role of the social studies in these two STEM schools.

For a period of eleven weeks, I collected data at the sample schools through semi-structured interviews with the two selected teachers (three 40 minute rounds), six students (two 25 minute rounds), and two building principals (one 30 minute round). While this study investigated teacher perceptions and experiences, the data collected from student and administrator interviews helped to triangulate findings and add context to the insights and views offered by teachers. Eight classroom observations at each school and the collection of important documents such as instructional activities, graduation requirements, programs of study, and student work were copied for analysis throughout the study.

Table 2
Participants in Study

STEM Academy	High Tech High
1 Teacher	1 Teacher
1 Principal	1 Principal
3 Students	3 Students
=10 Total Participants	

Teacher Participants

Mr. Jim Kelly (pseudonym) has been teaching high school social studies for the past seven years, with three of these years being at STEM Academy. For Mr. Kelley, teaching was a second career choice, as he earned his teaching credentials through a Master's teacher preparation program, with licensure, from a local university. Having grown-up in a low-income metropolitan area, Jim left his career as a network consultant with a Fortune 500 technology firm to work with at-risk youth. As an African-American male, he frequently noted the importance of black youth having caring teachers and positive male role models. While this perception led him into teaching, Mr. Kelley eagerly jumped at the opportunity to teach high school social studies when the position opened at STEM Academy. Jim was selected out of over 100 applicants because of his strong teaching credentials and his ability to integrate technology into the social studies curriculum. Since coming to STEM Academy, he has taught courses in American Government, U.S. History, and World History. Mr. Kelley sees his position as an opportunity to use his technological expertise and to get students using the tools in which they are interested to 'do' social studies.

Mr. Mark Jones (pseudonym) has been teaching for the past four years, all at High Tech High. He teaches U.S. History and American Government. Mark received his teaching licensure after completing an undergraduate social studies teacher education program at a local university. As an undergraduate, he took several instructional media and technology courses. While this formal training spurred his interest in technology, Mr. Jones' use of and 'tinkering' with, technology at home made him comfortable embedding it in his instruction. His strong academic and professional credentials, coupled with his experience in teaching with technology, made him a strong fit for High Tech High. Even though he enjoys using technology and having students use technology, his real passion involves issues of social and environmental justice - all frequent themes discussed in his social studies courses. Mr. Jones views digital literacy as an essential skill for citizenship in the 21st Century, as he feels these tools open up new communication, research, and advocacy opportunities.

Data Analysis

Over 500 pages of data were collected throughout a three month span. Since qualitative data rapidly accumulates in the collection process, timely and consistent analysis helped sort out significant features for data reduction (Miles & Hauberman, 1994). This sorting process involved a progressive focus whereby I worked to gather, sift through, review and reflect on data (Parlett & Hamilton, 1976). This process involved examining the data and organizing elements into general categories and then into themes. The intention involved moving from a description to explanation and theory generation (LeCompte & Preissle-Goetz, 1994). Three codes emerged from the data and were verified by an external auditor: (1.) Perceptions of STEM education, (2). social studies opportunities, and (3.) social studies challenges. After these initial codes evolved, more specific predominant themes for each code emerged.

Limitations

While this research and its findings may contribute to the research in social studies education and STEM education, it must be noted that this study has limitations as it had a limited number of participants. Knowing that a great deal of variability exists between STEM schools and programs, and STEM is often an acronym of convenience, this introductory study's findings emerged out of working with the few described participants at two different schools. The results of this study are not generalizable; however, qualitative researchers note the possibility of transferability (Patton, 2002; Merriam, 1998). In a transferability approach, the researcher provides the reader with a highly detailed description of the research design, context, and methods so that the reader is left to decide if the results can transfer to another context (Patton, 2002). Finally, unlike quantitative research, qualitative studies do not aim to rigidly isolate nor define variables to test hypothesis but instead, aim to undertake a thorough and intensive study of context and case (Neuman, 2007). Drawing from the collected data, then, this study is grounded in what the two sample teachers acknowledge to be their perceptions of teaching the social studies at STEM schools.

Findings

The data revealed a wealth of information pertaining to the enlisted research questions: What were social studies teachers' perceptions of teaching social studies at STEM high schools? And, what were the opportunities and challenges in teaching social studies at these two STEM high schools? In the sections that follow, I describe the emergent codes and their predominant themes. For instance, the code of "Perceptions of STEM education" contains two themes: 1. A Nation at Risk: Taping America's Potential, and 2. Social Studies as Glue. In the other two codes that follow (Social Studies Opportunities, and Social Studies Challenges), both are further divided into important themes. After establishing these codes and themes, I draw from them to answer my research questions. Finally, I discuss the implications of these findings for stake-holders in the social studies and offer some closing recommendations.

Perceptions of STEM education

The code of Perceptions of STEM education emerged as a result of collected interviews, documents, and observations that detail the importance the sample teachers and students participants ascribed to STEM education. The participant perceptions were quite favorable to

STEM education, with many revolving around the perceived importance of STEM education in meeting the nation's current and future labor needs. Themes that emerged under this category included: first, a nation at risk and second, social studies as glue.

> **1. A nation at risk: Tapping America's potential.**

In this theme, the two social studies teacher participants often gave lengthy explanations of the importance of STEM education. The teachers perceived STEM education as essential to the health and strength of the United States. This was clear in the sense of urgency portrayed by Mr. Mark Jones at High Tech High:

> STEM education is important and the United States is significantly behind. In order to advance and stay competitive internationally US students have to know and be proficient in math and science. The future of medicine, technology, our nation's infrastructure depends on it… As a social studies teacher, I understand and appreciate the importance of math and science.

STEM education was seen as a means of preparing the next wave of scientists, engineers, and citizens needed in a globally competitive age by Mr. Jones.

Overall, the two social studies teachers felt a sense of patriotic duty in meeting this national workforce need. This sense of patriotic duty was also evident when Mr. Jim Kelly at STEM Academy described the importance of STEM education and the social studies:

> Countries and their people are in competition with one another for jobs. There are people almost every day in Bangalore, India who can do all of this stuff a lot better than you or me and they want our job. I really believe that I can help students gain the skills they need to help our country land the jobs of the future.

These social studies teachers took pride in their ability to prepare students with the STEM understandings and skills to help bolster their nation's health and security. Outside of interview data, important collected documents highlighted the sentiment of a nation at risk in mathematics, science, technology, and engineering. This national challenge was evident on a flyer distributed by STEM Academy to prospective STEM students:

> Our nation's future hinges on our ability to prepare our next generation to be innovators in science, technology, engineering and math (STEM). Yet, far too few of our students are prepared for the challenges ahead and other countries are leaving us in their wake. Now, more than 100 companies are joining forces to work with schools and communities to **change the equation** for our youth and our nation.

Besides being evident in teacher beliefs and in literature distributed to students and parents, it was clear that students also understood the importance of STEM education to the economic health and security of the United States. Many students commented that they frequently hear about America's shortage of engineers, mathematicians, and scientists in social studies class. According to a 10th grade social studies student at STEM Academy, "In history class, we hear all the time about how our nation isn't developing enough scientists or engineers. Other countries are blowing us away. I came here because it will help me prepare for college and a career in physics." The interviewed teachers and students truly believed their efforts were essential in supplying the United States with a greatly needed supply of strong scientists, engineers, technicians, and mathematicians.

2. Social studies as glue.

The interviewed social studies teachers felt as if the social studies was pertinent to STEM education, describing their belief that social studies is a vital component. This attitude was especially evident when interviewing Mr. Jones at High Tech High:

> Social studies is really the glue that holds the individual STEMs together. The field is focused on looking at how those areas are applied in society for the betterment and worse of society… There are a lot of ethical and critical questions that need to be asked about science, technology, engineering, and math. I would argue that just because we can do something, like engineer a nuclear bomb, we need decision makers that can think through the ethics and implications of doing so…It's dangerous to have discreet knowledge without the critical thinking or decision making skills established through the study of social studies.

Knowing that technology is integral to human progress, the two social studies teachers thought students must be critical engineers and thinkers of technology. While students may gain the technological skills necessary to build and construct new devices through math, science, engineering and technology instruction, they often are ill prepared to contemplate the tough ethical and critical questions associated with its development. The two teachers said that while science and engineering foster necessary technical skills to build and construct, the social studies provides students with critical understandings and decision making abilities to think through the implications of this technology on their individual, national, or global interest.

Twice a year, teachers at these two schools would come together to plan a common semester-long interdisciplinary capstone project that all STEM students would complete. Many of the capstone projects encouraged students to think carefully and critically about engineering and technology. At STEM Academy, for instance, social studies students were asked to complete a Baraka capstone project. This semester-long project was based on the film Baraka, and students were asked to create digital documentaries that evoked emotion on a community issue. In this semester long project, students researched the impact of inequitable access to technology on society- particularly, the disproportionate access to life-saving medication and health care systems amongst people. Students in their social studies classes at High Tech High also were asked to think critically about the use of technology. During a capstone project on global issues and sustainability, students were asked to engineer solar panels and describe the implications of their proliferation on the nation's energy grid. While all students were expected to demonstrate mastery in mathematics, science, engineering, and technology, students also were expected to draw from knowledge and skills gained in the social studies. This expectation included thinking about the possibilities and limitations of constructing new technologies to solve global problems.

Mr. Jones at High Tech High highlighted the contributions of the social studies to STEM education:

> STEM education is a win-win situation for the social studies. In all facets of the curriculum, students are asked to problem solve, apply the scientific method to reach conclusions, and gain important skills. It's not a zero-sum win-lose game. With STEM education knowledge is interconnected and skills are built across disciplines.

The two social studies teachers said students gain essential skills and understandings by participating in social studies including problem solving, critical thinking, and the application of the scientific method. Mr. Kelley, at STEM Academy, highlighted the interdisciplinary nature of the social studies, and its natural fit into STEM education:

> History is the study of a bunch of disciplines. In order to teach history or the social studies, you need to draw from other disciplines. You need to explain how the different social sciences interact with one another… Knowledge doesn't happen in a vacuum. Everything is dependent upon other things.

 Mr. Kelley described the importance of involving students in drawing from a variety of 'soft' and 'hard' sciences to gain knowledge. This included students drawing from such disciplines as mathematics, science, engineering, technology, history, anthropology, sociology, psychology, economics, and geography for civic understanding.

Opportunities for the social studies in STEM education

This code emerged as a result of collected interviews, documents, and observations that address the opportunities available to teachers and students in the social studies at these two STEM schools. The three major themes under this category included an interdisciplinary learning environment, the integration of technology, and the opportunity for students and teachers to use their community as a learning laboratory.

   1.   **Interdisciplinary learning environment.**

Overwhelmingly, the two social studies teachers indicated STEM education valued a curriculum that cut across subject-matter lines to focus on bringing together a variety of disciplines to analyze issues. Since the social studies curriculum is interdisciplinary, much like STEM education, participants perceived this approach as well aligned to the goals of the social studies. Nowhere was this interdisciplinary planning and teaching more evident than in semester capstone projects according to comments by the school's principals. According to the Principal at High Tech High:

> These capstone projects cut across traditional disciplinary lines and are really trans-disciplinary. Students are expected to draw from a host of different disciplines to complete a project on a particular theme… For instance in the Health and Wellness Capstone Project students were asked to analyze the 10 different health indicators listed   on the Healthy People of 2010 Report by the US Surgeon General. In this project, students were asked to create statistical tools to calculate summary statistics… they were asked to explain how inherited diseases operate at the molecular level… students designed a "Health and Wellness Brochure in Chinese"… students also participated in Tai-Chi every Monday.

The projects are crafted during intensive interdisciplinary planning sessions. According to my observation notes on the Health and Wellness Capstone Planning Session at High Tech High:

> As teachers enter the conference room, they are directed into two different groups. Each group sits at its own table whereby members face one another. At my table, there are eight different teachers representing Social Studies, Math, Biology, Physics, Chinese, English/Language Arts, Engineering, and Computer Science. The Principal has asked these two groups to brainstorm potential capstone project specifications predicated on

Health and Wellness. After going around the room and explaining their ideas, a group leader records key aspects of a potential assignment… After each group has brainstormed a potential capstone design, they present their design to the other group. Then, the two groups work together to construct the final project.

In these capstone planning sessions, all teachers are encouraged to participate and voice their ideas.   Members are expected to comment on different proposed elements of the assignment. From the planning phase to the implementation phase, these capstone projects are interdisciplinary. Mr. Kelley, at STEM Academy, described this process when stating:

All students are expected to create an interdisciplinary capstone project that centers on an important theme… We frequently work with faculty in many areas to create and discuss the progress of assignments and projects. This year that theme is sustainability and students draw from the different disciplines to create a final produce. We devised a common assessment that all students complete that demonstrates mastery in a variety of disciplines.

Students valued these interdisciplinary capstone projects as well. When interviewed, a 10th grade social studies student at High Tech High commented:

I really don't feel like I'm only learning social studies in these projects. Like just American History or Government. I feel like I get to use many different areas. We really get to pull from many different subjects.

2. Technology integration.

The teachers and students interviewed said they enjoyed having stable access to technology in the social studies. The participants felt encouraged and compelled to use the available technology. Mr. Jones at High Tech High described the advantages of a social studies teacher using technology at their STEM school:

I really think that one of the major advantages of teaching at a STEM school is access to technology… sophisticated technologies. For instance, students are not only provided with laptops but the school and teachers help students trouble shoot… Teachers have access to SmartBoards, clickers, and other advanced software.

Mr. Kelley at STEM Academy also highlighted the technology friendly environment of his STEM School:

It's great that our use of technology in school is supported and encouraged. For instance, I've had students use Skype to communicate with people around the world. There are so many opportunities through the use of technology for students to research and process information. There are so many opportunities to build connections and to open-minds which is what the social studies is all about.

In classroom observations, social studies teachers and students used technologies to create and present content. Frequently accessed technologies included Smart Boards, Audience Response Systems, the Internet, digital video and audio editing equipment, and computers.

Since technology integration is a key element of STEM education and society, the sample teachers often felt compelled to allow students opportunities to use technology in the classroom. Mr. Kelley described students' use of technology as critical due to the heighted importance of technology in STEM occupations, to networking, and for college readiness:

We try to make all of our projects in the social studies as digital as possible. Today's students need to know how to use technology and feel comfortable around it. Technology is so important to networking, applying for jobs, and researching.

To the teachers interviewed, the use of technology made learning relevant and engaging for students. Since the integration of technology was supported and expected at both STEM schools, teacher participants frequently turned to the use of technology to promote student learning.

Students indicated they benefited by having the freedom and support to use technology in the social studies. When asked how this access to technology supported their learning, an 11th grade student at STEM Academy commented, "When I'm using technology I feel like I'm not just learning it but I'm understanding it…It really allows me to be creative." A capstone project students at STEM Academy frequently referenced as an example of integrating technology in the social studies was the Millennium Development Project. In this project, students were expected to create a digital documentary that explained the progress or lack of progress states were making in fulfilling their United Nations (UN) Millennium Development Goal commitments. Students were directed to research different UN Millennium Goals and their fulfillment status through Internet research and e-mail and Skype correspondences with scholars. After researching theses goals, students created and posted their digital documentary to YouTube. This project involved students applying their understandings and research as they constructed a digital documentary.

3. Community as a learning laboratory/ internships.

While being interviewed, the sample social studies teachers frequently discussed the importance of getting students out in their community, and bringing their community into the classroom. The focus was on seizing the educative potential of the local community to provide an authentic learning environment. Both teachers described assigned activities that allowed students to explore their community. These activities included students engaging in shadow/internship opportunities at local organizations/ institutions, students interviewing and observing members of their community, and students doing advocacy work in their neighborhood. When asked to explain the rationale for getting students involved with their community, Mr. Jones said:

School is a really artificial learning environment. It's a place where students from all the same age range interact with one another. It's in this closed, confined place and it's artificial. And, we try to make all of the learning happen here. I think that good social studies teachers bring the community and world into their classrooms. And, they take their students to the world.

Mr. Kelley was asked to elaborate on why STEM education is conducive to getting students in the community:

I know that our school and most STEM schools value and invest in partnerships within the community. For instance, our school has partnerships with NASA, several colleges and universities, and many large businesses… We are asked to use these partnerships to provide real world learning opportunities to our students.

In both schools, these social studies teachers and the sampled students tapped into the potential of established community partnerships. The Principal at STEM Academy commented that over 60% of high students earn college credit at local partner university/college institutions. Students at STEM Academy also are frequently asked to present their research to the community. A distributed handout on the UN Millennium Development Project asked students to:

> …research the UN Millennium Development Goals and the progress different states are making in fulfilling their commitments… Students will then create a digital documentary that highlights their research…. All students will be asked to present and discuss their movie at a film festival open to the community.

Students at High Tech High also were asked to interact with members and institutions in their community. This included 45% of all high school students earning college credit at local partner universities/colleges according to the school's principal. The Political Activist Project was one example of an activity devised by Mr. Jones at High Tech High that connected students with their community. An excerpt from a handout distributed to students on this project stated:

> After researching the different local candidates and their position on important issues, you will be assigned the task of volunteering at a local campaign headquarters of the candidate of your choice… A week before the election, you will be asked to provide an overview of ways in which you've contributed to the campaign. And, you'll be asked to describe what you have learned about your selected candidates and politics in general. Your presentation will be video recorded and uploaded to our schools website in an attempt to familiarize the community with different candidates for this upcoming primary election.

Besides getting students out in the community to research, observe, and learn, both social studies teachers frequently brought members of the community into the classroom. This included the invitation of guest speakers and tutors (which included parents, members of the business community, and college students) into the social studies classroom. Mr. Kelley described the advantages of a community based learning environment, which is encouraged and possible at a successful STEM School:

> STEM education is about engineering solutions to social problems. This real world experience helps our social studies students learn about these social problems from the ground-up… I believe in small groups, discussion, collaboration, and students understanding how they are connected to the rest of the world and their community. I believe in something more than college readiness, I believe in real world readiness. This is the ability to make good decisions, to solve problems, and to get students to work to improve their community.

Both teachers interviewed noted that STEM education was about breaking down walls of the school in some way. To these teachers, this could be done by getting students out into their community or by bringing their community and world to students.

Challenges for the social studies in STEM education

This code emerged as a result of collected interviews, documents, and observations speaking to the challenges of teaching the social studies at a STEM school. The two themes

that emerged under this code included confusion and ignorance over the mission of the social studies, and a prevalent notion by STEM faculty and administrators that the social studies is expendable.

1. **Confusion and ignorance (students and teachers).**

In this category, interviewees often gave responses describing the challenges of teaching the social studies at a school predicated on a science, technology, engineering, and mathematics curriculum. While these teachers and students indicated there are great opportunities for teaching and learning the social studies at a STEM school, it also was clear that that both teachers and students knew several challenges existed. The teachers acknowledged that they often have to educate and convince both students and other faculty of the importance of the social studies. Mr. Jones explained:

> I feel that you really have to sell the importance of the social sciences at a STEM School. I do find myself having to convince other faculty that the social studies matters. Especially, since social studies doesn't fit into the STEM acronym itself… While I think that a lot of social studies teachers have to do this at any school we probably find ourselves doing it a bit more.

Besides trying to educate faculty about the relevance and importance of the social studies to a successful STEM education, social studies teachers are often put in a position of having to defend the academic integrity of their discipline. Mr. Kelley described one such encounter:

> For instance, there's a calculus teacher that always talks about how the social studies is not a real subject. He ridicules and makes fun of the social sciences. However, I take his sarcasm with a grain of salt because I know how important the social studies and my classes are to my students.

In an interview with Mr. Jones, he also said that, at times, there is a lack of respect by other faculty for the academic integrity of the social studies:

> I know that a lot of other teachers in my building feel as if our class isn't as intellectually challenging as advanced math or science classes but we do foster a lot of important

skills amongst students. We try to make our class as relevant and rigorous as possible.

The teachers also cited the challenges of receiving ample attention and voice in the design of semester-long capstone projects. This included both social studies teachers noting that science, engineering, mathematics, and technology usually dominate the framework for capstone projects. This point is highlighted in my observation notes on the Health and Wellness Capstone Planning Session at High Tech High:

> The Principal has asked these two groups to brainstorm potential capstone project specifications predicated on Health and Wellness. After going around the room and explaining their ideas, a group leader records key aspects of a potential assignment. While all the teachers are given an opportunity to contribute their ideas to the project, very few ideas from the social studies teacher are recorded. It seems as if engineering, mathematics, and science are dominating the designing of this project.

When asked about the marginalization of social studies teachers' voices in the design of semester long capstone projects, Mr. Kelley stated:

>…I think that we really have to be cheerleaders for our disciplines. It's easy to feel sorry for yourself when your ideas don't get as much discussion time or support. It's obvious that this capstone project prioritized genomics and biology… I felt as if the project could have had a strong social studies emphasis like getting students to think through inequality based upon race, gender, and class.

The teachers acknowledged having to educate other teachers on the mission and benefits of the social studies. This lack of understanding often resulted, they said, in a disproportionate influence of STEM disciplines in the design of semester capstone projects. Both teachers acknowledged their desire to have an equal voice in design of capstone projects.

Student participants also acknowledged that the individual STEM disciplines usually are more valued at their school then the social studies. A student at High Tech High noted:

>We hear all of the time that we are being prepared to go work in math, science, technology, and engineering. So students are really focused on those areas, and working in those areas… You really don't come to a STEM school to be a lawyer or politician.

Even though student participants felt as if science, technology, mathematics, and engineering dominated the discourse at their school, and were more important at the school, all students commented on how they enjoyed their social studies courses. A 10th grade student at STEM Academy commented, "I really like Mr. K's social studies class. His class really made me think about the haves and the have-nots in society… His class was fun and we got to apply what we learned in projects and assignments."

2. Expendable: Susceptible to cuts in resources, supplies.

Teacher interviewees often gave responses that described the challenges of teaching the social studies at a school predicated on a science, technology, engineering, and mathematics curriculum. While the teachers and students indicated there are great opportunities for teaching and learning the social studies at a STEM school, both also noted several challenges. The teachers acknowledged that they often have to educate and convince other teachers as well as students of the importance of the social studies.   Both principals pointed to this being in part due to most STEM teachers having strong backgrounds in their respective content areas (i.e. physics, engineering, computer science, robotics, etc.) and not as much in pedagogy or PK-12 education. The principals at the buildings noted how most of the 'hard' science faculty (i.e. engineering, computer science, robotics, etc.) came to teaching through an alternative licensure process, having previously been employed a significant number of years working in their professional areas.

Table 3
Growth Over the Years: Student and Teachers

Year	Number of Students		Number of Teachers Positions	
	STEM Academy	High Tech High	STEM Academy	High Tech High
2006-07	98	x	6	x
2007-08	200	x	12	x
2008-09	298	100	18	7
2009-10	396	195	24	12
2010-11	400	299	24	18

Enrollment at both schools has swelled since their founding, which means that there has been an increased demand for highly qualified STEM teachers in these schools. While student enrollment has grown, and there has been an increase in the overall number of teachers, the social studies has been disproportionately affected.   For the past two years, High Tech High has utilized a long-term substitute in teaching all 9th grade social studies classes so, students have not received instruction from a credentialed/ licensed social studies teacher. When asked about the delay in filling this social studies position, High Tech High's Principal noted, "We are currently looking to fill this position with a highly qualified candidate and have yet to locate a candidate we feel confident in." Mr. Jones, however, pointed out other positions in science, mathematics, and engineering have been quickly filled with credentialed and licensed candidates by the administration. As the 2010 school year opened, High Tech High also failed to locate a qualified 11th grade social studies teacher after a one year search. Thus, students in grades 9 and 11 do not have a licensed social studies teacher despite a large surplus in the number of credentialed social studies teachers in the state (AAEE, 2008). This lack of resources and qualified staffing has led Mr. Jones to conclude that administrators feel as if the social studies is expendable:

> I just think that math, engineering, or science would never have to wait two years to fill a position with a licensed teacher. It seems as if at times there is a double standard for the hard sciences and the soft sciences… This is just one example.

While STEM Academy has all of its social studies positions filled with credentialed and licensed social studies teachers, Mr. Kelly social studies is more susceptible to budget cuts than the STEM areas:

Lately, times have been real tough for the school and we've had to make budget cuts…
In the social studies, we were supposed to get updated textbooks this year but because
of budget cuts it was suspended… Also, we were planning to travel to the Holocaust
Museum in Washington, DC but that too was canceled… We have made far fewer
budget cuts in science, math, and engineering. Those departments all received their full
budgets and have trips scheduled.

When asked about the discrepancies in access to resources and funding, the Principal at STEM
Academy noted:

We really had to make some tough financial decisions this past year, like most schools.
This means that we have to weight what's most important, and what most in-line with
the needs of our students… In many ways, all departments have been affected by
budget cuts.

Both teachers indicated their departments were susceptible to disproportionate budget
cuts and a reduction of resources. At High Tech High, there was confusion and bewilderment at
a lack of progress in filling both the 9th and 11th grade social studies positions. At STEM
Academy, Mr. Kelley conveyed his conclusion that the social studies department has been
disproportionately affected by budget cuts.

Besides teacher participants pointing to an issue in how faculty, administrators, and
students value the social studies, the amount of contact hours students receive in the social
studies is less than other core subjects at both schools. After a review of the school's programs
of study, I noted that students at both schools are required to take at least 4 units of
mathematics, science, and language arts but only 3 units of social studies. Over the course of
four years, this results in significantly less social studies instructional time. State policy equates
one contact hour to three hours of student work per week so, students at both schools receive
between 420-525 hours of instruction in science, mathematics, and English, and 315 hours of
contact in the social studies over their four years of high school.   Social studies teachers at both
schools have significantly less instructional time when compared with other core areas and, as
noted earlier, face a disproportionate lack of access to resources and qualified social studies
personnel. After reviewing the core courses of study and course offerings, it is clear that there
are far fewer social studies course offerings in the social studies. Students at both STEM
schools are expected to complete the minimum state requirement of three units in social
studies for graduation.   Outside of these social studies courses, no other social studies electives
are offered at these schools.

Table 4
Core Courses of Study and Course Offerings

Core Courses of Study & Course Offerings

STEM Academy	High Tech High
Science: 4 Units	Science: 5 Units
• Biology	• Biology
• Physics	• Physics
• Chemistry	• Chemistry
• Research Preparations	• Advanced Research Methods
	• Science Elective
Math: 4 Units	Math: 4 Units
• Algebra II	• Algebra II
• Trigonometry	• Geometry
• Statistics	• Statistics
• Geometry	• Pre-Calculus
• Pre-Calculus	
Engineering & Technology (1 Unit)	Technology & Engineering: 4 Units
• Introduction to Engineering	• Survey of Engineering
• Principles of Engineering	• Principles of Engineering
• Biomedical Technologies	• Introduction to Fabrication
• Media and Communications	• 21st Century Technologies
Language Arts: 4 Units	Language Arts: 4 Units
• English 9	• English 9
• English 10	• English 10
• English 11	• English 11
• Other Elective	• English Elective
Social Studies: 3 Units	Social Studies: 3 Units
• American History	• American History
• American Government	• American Government
• World History	• World History

Discussion and Final Thoughts

This study investigated questions about social studies education in two secondary schools focusing on STEM education. Specifically, I examined the perceptions of two social studies STEM high school teachers to better understand their perceptions of the challenges and opportunities of teaching the social studies at a STEM school. Through social studies teacher interviews, student interviews, principal interviews, observations, and document analysis, I investigated the research questions:

- What were social studies teachers' perceptions of teaching social studies at STEM high schools?
- What were the opportunities and challenges in teaching social studies at these two STEM high schools?

Three major findings emerged:

1. The two sample social studies teachers describe a perception of STEM education as essential in building a stronger United States, and these teachers perceive the social studies as integral to a successful STEM education.
2. The sample teachers view STEM education as providing opportunities for interdisciplinary learning, integration of technology, and connection of students with their community.
3. Teachers perceived challenges from a lack of full appreciation and awareness of the mission and purpose of the social studies, and the often disproportionate allocation of access to resources and voice.

In this section, I will build upon these three findings of the study with a discussion on its related implications for the social studies community and future research. These discussion points include: 1. A need for a well-rounded curriculum in STEM education that includes a vibrant and strong social studies, 2. A need to collaborate with, and pull away best practices from, STEM education. This includes preparing social studies candidates to create a meaningful and authentic learning environment for students. To do this, social studies teacher candidates should be prepared for interdisciplinary teaching, to successfully integrate technology, and utilize a place-based instructional approach. Moreover, in an attempt to bolster the social studies, pre-service and in-service social studies teachers must be equipped to justify the importance of a strong social studies program in a rapidly growing STEM movement, and, 3. A call to educational researchers encouraging them to investigate how the STEM movement has influenced the teaching and learning of social studies, and ways in which social studies education can enhance STEM education.

There has been a frenzy of activity at the national and state levels to bolster student performance and involvement in the STEM content areas. This desire is based upon fears that American students are not adequately prepared in science and mathematics, jeopardizing the U.S. ability to compete in the global economy (Atkinson et. al., 2007). Thus, STEM education has emerged as a means to prepare students for successful careers in STEM areas. Few researchers, however, have examined how this massive public and private investment in STEM education influences the area predicated on fostering informed and active citizens, the social studies. In Ohio, lawmakers included significant funds in the FY 08-09 state budget to provide

incentives for students to pursue STEM careers and to develop STEM schools (AM. Sub. HB 119-Dolan). This legislation outlines the advantages of STEM schools in that they offer students "…a rigorous, diverse, integrated, and project-based curriculum (Ohio Revised Code Section 3326.01)."

In this study, participants acknowledged the importance of social studies in preparing students with the habits of mind necessary to ensure America is economically competitive in the 21st Century. While students should be expected to learn mathematics and science, participants noted the importance of these discreet disciplines being grounded in a social, political, economic, and environmental fabric. The sample social studies teachers noted that this fabric is the basis of the social studies, and it is an essential 'glue' that holds the STEM disciplines together. Thus, it was clear from participant responses they felt as if the social studies complemented the STEM mission of building a healthier, stronger country.

Besides helping students better understand the historical, cultural, political, social, and environmental connections of the STEM disciplines, a strong social studies experience helps students gain essential understandings and skills that equip them to emerge as active citizen in a global and multicultural age (NCSS, 2010). As nations, workers, and families from varying nation states become more globally interconnected, there's a need for students to gain the skills and knowledge necessary to understand and navigate an ever-changing global landscape (Merryfield, 2002). When given appropriate resources and rank, the social studies is an effective outlet for deeper explorations of global issues, international perspectives, cultural diversity, and advocacy (Pang, 2004; Bolgatz, 2005).

A strong social studies curriculum in STEM education heightens the academic rigor and relevance of the curriculum. American and world history are filled with opportunities to get students thinking critically about issues and events (Patrick, 1986; Barton & Levstik, 2004, Banks, Banks, & Clegg, 1999). When receiving a strong social studies experience, students participate in a rigorous curriculum that fosters higher-level thinking. In American History, for example, students often are asked to evaluate the authenticity of primary and secondary source information (Lee, 2002), to take and defend particular positions (Hess & Avery, 2008; Danzer & Newman, 1996), and to engage in projects that better their community and world (Maguth, 2011). Through such social practices as classroom debates, simulations, and real-world application, not only are students pushed to extend their thinking but, learning becomes exciting, meaningful, and relevant. A strong social studies experience would align well to the STEM education mission of preparing students for a rigorous, relevant, and globally interconnected age.

It was clear that interviewees perceived STEM education partnered with the social studies as offering students several advantages. These advantages included prioritizing interdisciplinary instruction and assessments, requiring and supporting the integration of technology by students and teachers, and providing students with the opportunity to interact with and study their community. This sort of innovative, rigorous, and relevant educational environment is well supported in social studies research (Chardwick & Wedlin, 2006; Risinger, 2005; Maguth, 2009; Resor, 2010).

As the number of STEM schools increases, the social studies community could benefit by preparing pre-service social studies teachers who can incorporate these desired practices into their classroom.   Even though these features are essential in STEM education, the social studies also has been at the forefront of advocating their use in the classroom. Research exists in the social studies that discusses ways in which interdisciplinary teaching and teaming makes learning relevant to students (Chardwick & Wedlin, 2006; Risinger, 2005). A growing amount of social studies research describes and examines best practices for social studies teachers and students in using technology in their classroom (Maguth, 2009; VanFossen, 2001; Saye & Brush, 2004). The social studies has historically been at the forefront of instructional approaches that get students reflecting on issues in their community (Dewey, 1907). This sort of student to community connection is endorsed through a place-based instructional approach, and research is growing that connects place-based education and the social studies (Resor, 2010; U.S. Park Services, 2009). The essential features of a STEM education include interdisciplinary teaching, the successful integration of technology, and the building of partnerships and connections between students and their community (OSLN, 2010) have all long been endorsed by the social studies. While the social studies community understands the connection between STEM education and the social studies, there exists a need to educate the broader education community through research, education, and advocacy. A key finding in this study was that the teachers felt challenged by a lack of full appreciation and awareness of the mission and purpose of the social studies in their schools, and that the social studies is often disproportionately affected by a lack of access to resources and voice. A field already under attack via reduced instructional time (Pace, 2007), state standards and exams, and biased textbooks (Loewen, 2010) must not also fall victim to a STEM education movement that is unresponsive to, or ignorant of, the benefits of a strong social studies. The social studies community must work to build bridges of mutual understanding with STEM schools and content areas. This process includes preparing pre-service and in-service social studies teachers who can advocate for a strong social studies curriculum and program. Teachers should be able to articulate the social studies' importance and relevance to the development of informed, active, and responsible citizens in a global and multicultural age (NCSS, 2010).

Educational researchers are encouraged to build off of my initial research to more thoroughly examine how the STEM movement has influenced the teaching and learning of social studies, and ways in which social studies education compliments STEM education. As the STEM movement gathers moment, researchers should further examine the learning opportunities afforded to social studies students; especially, as they relates to preparing citizens for a globally and technologically sophisticated age. More exploration is needed of the attitudes of STEM faculty towards the social studies.

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Appendix

Interview Protocols

	Social Studies Teachers	**Students**	**Principals**
Round 1	1. Tell me a bit about yourself. 2. Why did you decide to teach the social studies? 3. Why did you decide to teach at a STEM School? 4. Do you feel STEM education is important? Why? 5. What do you like best about teaching social studies at a STEM School?	1. Tell me a bit about yourself. 2. Why did you decide to enroll in a STEM school? 3. What's your favorite class? Why? 4. What do you like best about being at a STEM School? 5. What do you like least about being at a STEM School?	1. Can you tell me a bit about yourself? 2. Can you tell me a bit about your STEM School? 3. What are the opportunities and challenges for faculty and students in STEM education? 4. What sort of partnerships does the school have with organizations/businesses? 5. What's the role of the social studies at a STEM School? 6. Does the social studies receive equal funding, resources, and voice?
Round 2	1. What is your approach to teaching the social studies? 2. What are the opportunities in teaching the social studies at a STEM school? 3. Is team teaching/ interdisciplinary learning valued? How? 4. In what ways do you and your students use	1. What do you want to do after graduating? 2. What are your perceptions towards the social studies? 3. What do you like best/least about social studies? 4. How do you use technology in social studies? What do you like/dislike about using it?	

	technology in the social studies? 5. What do you like/dislike about the Capstone Projects? How important is the social sciences to the completion of these projects?	5. What do you think about the end of semester capstone projects? How important is social studies to completing it?	
Round 3	1. What are the challenges of teaching the social studies at a STEM School? 2. How is the social studies perceived by other faculty at a STEM School? 3. Is the social studies as important and valued as the STEM disciplines? 4. In what ways do students engage with their local community (community partnerships)? 5. How do you get students exploring and connected to their surrounding community? 6. How do students perceive the value of the social studies?		