Connectivism, Globalization, and the Digital Divide:
A Resource for Bridging the Gap

A Field Project Presented to the Faculty of the School of Education
University of San Francisco
In Partial Fulfillment of the Requirements of the Degree of
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in
Digital Media and Learning

By
Aaron J. Brill
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Under the guidance and approval of the committee, and approval by all the members, this field project has been accepted in partial fulfillment of the requirements for the degree.

Approved:

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12-10-08

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Dedication

I would like to thank my parents for guiding me toward a career in education, all the teachers who inspired me, and Dr. Bansavich for overseeing my Field Project construction. Thanks.

-AJB

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http://abrill.wiki.usfca.edu/

Chapter I

The introduction of web-based tools coupled with soaring levels of global connectivity has increased communication between cultures exponentially. This technological revolution and the resulting global impact now require employers to seek job applicants with specialized high-tech skills and training from around the globe. If the United States wishes to continue to compete as a superpower, and lead by example in terms of providing opportunity, our society should be comfortable with technology and exhibit fluency using various computer applications.

The theory and practices that affect student learning must evolve to keep pace with the advances in technology. As understanding of social structures and learning environments increased, previous schools of thought such as behaviorism and cognitivism, cleared the path for newer ideas, such as constructivism, to be considered and utilized. The increased use of technology and changing beliefs about knowledge, as well as the trend of contemporary scholars to challenge previous conceptions and develop new contentions, have given rise to an exciting school of thought: connectivism.

Advocates of connectivism contend that the half-life of knowledge is diminishing because of the rapid pace of life during the ongoing technological revolution (Siemens, 2004). Supporters of connectivism additionally assert that what is vital to learning is no longer simply fact recall, but rather the knowledge of *where* to search to retrieve relevant information.

Greater access to hardware, software, the Internet, and, perhaps most importantly, quality instructors will generate "successful," motivated, engaged, creative learners. When and if these "successful" learners, coming from varying regions and socioeconomic backgrounds, enter the job market, they will possess the knowledge of *where* to search for resources, thus becoming self-advocates.

This project will focus on connecting learners with information in attempts to overcome the United States' present state of technological inequality, namely, the digital divide.

Statement of the Problem

Cheap labor offered abroad means that jobs traditionally held by Americans are contracted overseas (Gokhale, 2007). Additionally, the digital divide that exists within the U.S. translates to a lack of opportunity for underserved communities (Servon, 2002). The digital divide is a term used to refer to the problem that certain communities lack access to technology and qualified instructors. According to Servon, this problem can be associated with ethnicity, socioeconomic status (SES), gender, age, and geographical region. The U.S. needs a sharp increase of knowledgeable, specialized workers in order to continue competing on an international level (Judge, Pucket, Bell, 2006). The most effective way to develop qualified workers for tomorrow is to invest in the education of today's youth. Access to technology, the Internet, and properly trained educators is the key to overcoming this grave situation if today's students are going to compete in tomorrow's international job market. If the technology gap is not lessened, today's students will become tomorrow's unqualified job applicants, and ultimately make up the unemployed masses. Gokhale (2007) cites Forrester Research stating that between 250,000 and 500,000 U.S. jobs were sent abroad between 2002 and 2005, and that by 2015, an estimated 3.4 million jobs will be offshored. These statistics suggest that if drastic change is not taken, the trend of shipping jobs overseas will continue and the U.S. will be replaced as a world leader.

Background and Need

The trend of granting technology-based jobs to foreign workers increased exponentially with the race to prepare for the projected effects of Y2K (Gokhale, 2007). In the 1990s, as the

dawn of the new millennium approached, a major computing problem was predicted. The fear was that various applications would process the digits 00 as the representation for the year 1900 instead of 2000 (King & Winters, 2008), causing global concern. This issue created an abundance of jobs to be performed with a finite deadline for the work to be completed. Computers across the globe needed to be checked and updated (Friedman, 2005). Business needed to contract workers outside of their companies -- and the U.S. -- at a severely reduced rate in order to cut costs and fully prepare.

In 1998, the Secretary of Commerce released a report following up on the assertions made in *Falling Through the Net* (Department of Commerce, 2000). The results indicated the following:

> Countries that have an insufficient supply of skilled workers will see high-skilled, high paying jobs migrate to countries that can supply the needed talent. Those that have a surplus will find job opportunities opening for their workers in overseas organizations. Even though the United States has led the world into the digital age, we face these same realities. Without a concerted effort to develop students and workers to meet the new challenges of the digital economy, the United States could face a migration of high-skilled, high-wage jobs to other countries. (Secretariat on Electronic Commerce, 1998, p. 49)

Outsourcing is the process of relocating jobs, at a reduced cost, outside the company (Kakumanu & Portanova, 2006). When these jobs are sent over seas, the term used is "offshoring" (Gokhale, 2007). Traditionally, companies used outsourcing as a short-term solution in a time of crisis. However, with the advent of global high-speed Internet access in the years since the millennium, more and more companies have adopted offshoring as a business

practice to lower expenses over a longer period (Gokhale, 2007). Furthermore, ubiquitous tools such as email significantly ease communication between domestic employer and offshore employee, thus perpetuating the situation and allowing the current trend to continue (Kakumanu & Portanova, 2006).

This paper will focus on the problem of the digital divide. The most effective way to lessen the digital gap is for public policy to demonstrate a national commitment to improving public education, and more specifically, implementing technology, along with properly trained instructors into educational systems (DiBello, 2005). Elected officials must invest in youth of the country for the sake of its future (Salpeter, 2006). "Thus, for computers to become an integral tool for learning, further improvements are needed in the quantity and quality of computers available in classrooms" (Judge et al., p. 58). If the U.S. does not wish to lose its status as a world superpower, there must be equitable technological distribution in schools so the have-nots can bridge the gap and represent the country as they compete for jobs internationally.

Purpose of the Project

The purpose of this project is to explore the issue of the digital divide and to identify resources available to address the problem. In response to this problem, a wiki, a collaborative website for others to contribute, will be developed to host the resources for those wishing to incorporate technology into school systems. The theory to support this project is connectivism. The wiki's design will follow the tenets of this theory by providing resources and directions on *where* to search in order to integrate technology into American schools. It will contain links to open-source software in order for colleagues to add their own resources. The wiki will serve as a reference point for educators and administrators who want to begin integrating and implementing

technology into their schools or districts in order to bridge the digital divide. The information presented within the wiki will include the following:

A: Links to free software and online tools

B: Contact information for grant petitions and applications

C: Information on an inexpensive way to bring hardware to schools

D: Downloadable research articles that informed the product

E: Links to digital lessons known as "Webquests"

F: Links to information on connectivism

G: Miscellaneous educational technology information

Definition of Terms

Behaviorism: Behaviorism is solely concerned with observable behavior. The main assertion is that once a new behavioral pattern is frequently repeated, it becomes automatic (Mergel, 1998).

Cognitivism: Cognitivism is concerned with the thought process behind behavior also known as schema. Cognitivists observe changes in behavior and attempt to comprehend what is happening inside the mind of a learner (Mergel, 1998).

Constructivism: Constructivism was developed on the idea that humans form their own reality through individual experiences and schema. Constructivism concentrates on the learner's preparation for a wide variety of situations (Mergel, 1998).

Connectivism: Connectivism asserts that because information is constantly changing and being updated, what becomes vital to learners is not the acquisition or development of knowledge, but rather, the ability to seek it out within a system or organization when needed, to ascertain whether or not it is still current and acceptable, and to recognize the connections present within meta-knowledge (Siemens, 2004).

Digital divide or technology gap: The digital divide is traditionally defined as "the gap between those who have access to computers and the Internet, and those who do not" (Servon, 2002). Beyond access to hardware, software, and the Internet, the other fundamental issue to consider is access to properly trained instructors once the users possess physical access to the tools mentioned above.

Haves: When referring to those affected by the digital divide, this term is used to represent the group made up of those with access to technology. Furthermore, recent research has shown that in addition to access to technology, this community also has access to instructors fluent in technological integration into various curricula.

Have-nots: When referring to those affected by the digital divide, this term is used to represent the group made up of those without access to technology. Again, studies have shown that in addition to lacking access to computers and the Internet, this population lacks in access to knowledgeable educators, able to seamlessly weave technology into various curricula.

Summary

There are two fundamental problems to be explored in this Field Project. First, the fact that global access to high-speed Internet spurred the recent surge of U.S. companies to internationally outsource, or offshore technology-based jobs. Second, a substantial percentage of our population is not comfortable with technology based on the lack of access to a variety of tools and instructors who have not been properly trained to utilize and teach with technology. Third, the educational theory of connectivism will be explored, and its assertions coupled with the issues of globalization and the digital divide informs the need for drastic modification to U.S. education. If the United States is to continue in its role as a global superpower and model of success for other nations, fundamental changes must occur with regards to access and training of

technology in schools. The most important way to overcome these issues and affect change is to invest in the country's youth to create successful learners, ones that will mature into technically capable workers able to compete on an international level.

Chapter II

As the world becomes more and more reliant on digital technology, students should receive access to modern technology tools and quality instruction in order to foster motivated, creative learners engaged with all aspects of various curricula. In Penuel's (2006) synthesis of various one-to-one computing studies, he asserted that greater access to and comfort with technology leads to stronger organizational skills and a broader knowledge of resources, thus assisting in students' preparation for entry into the workforce. As many technology-based jobs traditionally held by U.S. citizens are shipped overseas, a growing need for specialized workers in this country is rapidly emerging (Gokhale, 2007). All the while, arguments exist as to whether or not the incorporation of technology into the classroom really enhances student performance (Pfaffman, 2008). After surveying teachers from both high and low resource schools from around California, Valadez and Duran's study (2007) indicated that major discrepancies exist in access and the type of technology use between the differing socioeconomic school populations. Low resource environments provide high student-to-computer ratios, and tend to utilize software that promotes the mere practice of skills. Meanwhile, the high resource schools surveyed tended to have a much lower student-to-computer ratio, and their students were engaged in more meaningful, imaginative activities. This study suggested that if adequate access to computers, the Internet, and above all, educators well versed in utilizing technology, are available to *all* types of learners, their motivation, creativity, and engagement with the curricula will rise.

As technology's role in education continues to be debated, traditional learning theories are being explored and altered by new researchers. Furthermore, new theories must be formed as existing conditions in education drastically change. In this regard, Siemens (2004) developed the theory of connectivism in response to the current technological revolution and the perceived

limitations of behaviorism, cognitivism, and constructivism. The following literature review provides a synthesis of, as well as background information on the inception of connectivism, a discussion of aspects of the digital divide present in the U.S. and thoughts from both sides of the argument as to whether or not the integration of technology into school systems is beneficial. The aim is to identify if a need exists for a product that connects users, regardless of socioeconomic background with tools for integrating technology into school systems. The affirmation and realization of this connection will assist in lessening the digital divide.

Connectivism: Background and Synthesis

At the heart of educational learning theories is the acquisition and storage of knowledge. Behaviorism, cognitivism, and constructivism all share the tenet that knowledge is sought after and attained, or created in the mind of the learner. All three of these traditional learning theories propose that once this knowledge is obtained or constructed, it will exist inside of the mind of that student (Siemens, 2004). The discrepancies present between these major schools of thought center on the varying ideas of how one develops this knowledge.

Behaviorists view the developing mind as a blank slate, and argue that an instructor provides knowledge to the learner (Mergel, 1998). Developers of this theory such as Pavlov, Thorndike, Watson and Skinner centered their focus on new, noticeable behavior, asserting that when it becomes automatic, it is learned. Although much of their efforts were geared toward the field of behavioral psychology, the assertions made about the developmental mind had lasting impact on the educational community as well.

Cognitivism, which was born out of behaviorism, similarly focuses on behavior. Behaviorist theory shed light on behavioral patterns, yet was unable to explain certain actions that did not appear to follow the notions presented by its claims (Mergel, 1998). “For example,

children do not imitate all behavior that has been reinforced. Furthermore, they may model new behavior days or weeks after their first initial observation without having been reinforced for the behavior" (Mergel, p. 6). Cognitivists concern themselves with changes in observable actions, and the thought process or organization (schema) behind them. "Schema may be combined, extended or altered to accommodate new information" (Mergel, p. 7). Cognitivists assert that learning occurs through the reformation of thoughts and facts in response to a variety of outside forces (Siemens, 2004).

Whereas behaviorists and cognitivists both view knowledge as existing outside of the learner's mind and something to be sought after and obtained, constructivists see the learner as the creator of his or her own knowledge (Siemens, 2004). "Enter the constructivist learning theory which tells us that each organism is constantly in flux, and although the old models work to a certain degree, other factors must also be considered" (Mergel, p. 10). Advocates of this theory view the instructor as more of a guide, preparing students to generate their own reality and learning, rather than a source of information (Mergel, 1998). Although these three traditional learning theories were useful and appropriate for their time and the type of learning they intended to explain, none seem to address concerns raised with the changes that accompany present technological advances. Siemens (2004) addressed this issue as he stated the following:

> Many important questions are raised when established learning theories are seen through technology. The natural attempt of theorists is to continue to revise and evolve theories as conditions change. At some point, however, the underlying conditions have altered so significantly, that further modification is no longer sensible. An entirely new approach is needed. (Limitations of Behaviorism, Cognitivism, and Constructivism, para. 3)

Connectivism originated from the notion that advances in technology, particularly the immediate and widespread access to information via the Internet, have made the ideas present in traditional schools of thought outdated and therefore obsolete. "These theories do not address learning that occurs outside of people (i.e. learning that is stored and manipulated by technology)" (Siemens, Limitations of Behaviorism, Cognitivism, and Constructivism section, para. 1). Siemens contends that, because of the rapid pace of the digitized world, the facts that comprise knowledge are constantly being rewritten and updated. The main tenet of the theory asserts that because information is continually evolving, what becomes vital to learners is not the acquisition or development of knowledge, but rather, the ability to seek it out within a system or organization when needed, to ascertain whether or not it is still current and acceptable, and to recognize the connections present within meta-knowledge (Siemens, 2004).

If educators and administrators are to adopt connectivism into their learning environments, then effects of the technology gap become all the more worrisome for current and future students. Low resource populations will continue to fall further behind, not just in terms of access, but also in the types of learning and opportunities that access provides. Users cannot possibly accomplish the goals of connectivist learning without ready access. Thus, a cyclical system of the have nots remaining underserved will continue. If the have nots remain stagnant in terms of their technological access, comfort and skill level, their chances of obtaining highly skilled, technology-based jobs diminishes (Salpeter, 2006). Penuel (2006) comprehended and expanded on this notion as he stated the following:

> Ubiquitous, 24/7 access to computers makes it possible for students to access a wider array of resources to support their learning, to communicate with peers and their teachers,

> to become fluent in their use of the technological tools of the 21st century workplace. (p. 332)

Aspects of the U.S. Digital Divide

> Digital equity is a social justice goal, ensuring that all students have access to information and communication technologies for learning, regardless of socioeconomic status (SES), disability, language, race, gender, or any other characteristics that have been linked with unequal treatment. (Judge, Puckett, & Bell, 2006, p. 52)

In the years since the initial publication and reassessment of *Falling Through the Net* (Department of Commerce, 2000), major strides have occurred in terms of providing access to computers and the Internet for the have-nots in the U.S. (Salpeter, 2006). According to Salpeter, the Clinton Gore administration (1992-2000) focused national attention on this issue and created public policy on improving nationwide access. This administration saw the current and future benefits of technology, as well as the need for computer access for all U.S. citizens. They felt, just as researchers like DiBello and Salpeter, now feel that bridging the digital gap is a key issue when considering the future of education and employment in the U.S. In 1993, members of the Information Infrastructure Task Force convened in Washington DC in order to develop a plan for providing equitable access for all citizens.

> We aim to extend the "universal service" concept to ensure that information resources are available to all at affordable prices. Because information means empowerment – and employment – the government has a duty to ensure that all Americans have access to the… potential of the Information Age. (Information Infrastructure Task Force, Washington DC, 1993)

In 2006, Judge, Puckett, and Bell investigated improvements made toward achieving digital equity. Their survey population included 8,238 kindergarten, first, and third grade students from public schools within varying economic regions. They cited marked improvement in terms of technology access to underserved communities. For example, from 1994 to 2002, the percentage of classrooms with Internet connectivity in high poverty schools increased from 2 to 89% (Judge et al, 2006). These developments are encouraging, yet further results from this study indicated that although access has increased, content and use have not. For example, "in 2001, children and adolescents living in poor families were less likely to use computers at school (75%) and at home (32%) than were children and adolescents living in families with high SES (83% and 75%, respectively)" (Judge et al, p. 53). Salpeter (2006) concluded that merely providing physical access to computers and the Internet does not translate to the bridging of the "achievement gap" (p. 28). Salpeter uses this term to refer to the fact that students of particular cultural backgrounds, specifically "African Americans, Hispanics, and Native Americans" are scoring significantly lower on standardized testing than their Asian and Caucasian counterparts (Salpeter). What is more troubling than low test scores is the indication that this trend continues to affect these particular learning communities over time, and translates to other areas such as "Advanced Placement course participation, high school graduation rates, and college entrance and graduation rates" (p. 28). If members of these certain cultural communities are underrepresented in AP courses and have low matriculation and graduation rates, the likelihood of attaining highly skilled jobs lessens and they will continue to be marginalized. According to Salpeter, low access to technology, and adequate digital access without proper instruction will have similar detrimental effects for the developing youth.

DiBello's (2005) research on digital equity suggested that access to instructors fluent with technological resources coupled with a commitment on the part of schools to keep up with advances is essential for technology to make a lasting impact on the lives and performance of students. "Each and every day, new versions of software and hardware are emerging and a school system cannot expect teachers to stay current unless they provide appropriate training" (p. 240). The implication of such a statement is that "quick fixes" won't bring about the types of changes desperately needed by underserved communities. DiBello found that training for instructors, in addition to physical access to computers and the Internet, is truly at the heart of this issue. The effects of the digital divide are not mere discrepancies between populations on test scores, but rather exposure to, and the ability to take advantage of various educational and employment opportunities as means to an end of a successful, independent life. Servon (2002) struck at the heart of the issue as she stated the following:

> The digital divide is much more complex than a mere lack of computers. Simplistic solutions have therefore masked and perhaps even exacerbated the larger problem. When we provide people with computers, we find that not much changes. IT on its own does not function as a ladder out of poverty. (p. 52)

For the digital gap to be narrowed, it seems access cannot be limited to technology, but must also include teachers trained to utilize various tools within curricula as well as a commitment on the part of funders and administrators to keeping the most current tools available for all educational communities.

What Successful Computer Integration in Schools Looks Like

For technology to significantly impact learning and future opportunity of students, it must be effectively integrated into all aspects of curricula and presented to learners by well-trained

faculty. When considering the possibility of ubiquitous future technology use, Dibello (2005) stated, "Should we manage to meet the need for commitment, the need for updated resources, and the need for training, then we most definitely will be on to something" (p. 241).

In January of 2002, after nearly two years of task-force meetings, Angus King, the former governor of Maine entered into a historic contract with Apple computer, purchasing nearly 20,000 iBook laptops in order to provide computer and Internet access for every seventh and eighth grade student and teacher in the state (Curtis, 2003). Beyond merely purchasing and providing the hardware, two instructors from each of the 243 schools were designated to receive training on effective implementation, and to serve as faculty resource personnel within the individual school sites. Curtis reported that computers, Internet connectivity, and how teachers utilized these tools impacted every aspect of student life, from research assignments for social studies to collecting and documenting information used in science field projects to homework and organizational skills.

In February of 2004, researchers from the University of Southern Maine conducted a study in which they set out to evaluate the effectiveness of Maine's middle school laptop project. Information was gathered from all over the state, and the general consensus was that the program was extremely successful. Teachers reported using the computers in a variety of ways, and that the implementation of these machines assisted the instructors in meeting statewide learning standards as well as individualizing certain aspects of the curricula to meet the needs for students with various learning styles (Silvernail & Lane, 2004). Students surveyed reported an increase in organizational skills as well as efficiently produced, quality work resulting from the use of the laptops. Eighth graders moving on to high school without the laptops expressed a wish for continued use when considering their high school years. Additionally, some participating

students assisted with technical glitches for classmates and teachers, thus increasing their engagement with the new tools. The state of Maine paved the way for increased access to computers and trained educators and can be used as a model for any region wishing to increase their students' familiarity with technology. Other states such as Florida and New Mexico have already begun to follow in Maine's footsteps through the creation and integration of their own laptop initiatives. The success of the Maine Laptop Project suggests that if more administrators nationwide support technology-based learning, U.S. students will exhibit more fluency when using digital technology, more organizational skills, and greater engagement with all aspects of their curricula all leading toward further opportunities for learning and employment.

Opposition to Technology in Education

Recent findings suggest that some members of the academic community are not yet convinced that investing in digital technology for students is a worthwhile endeavor (Wartella & Jennings, 2000). This argument is nothing new for educators and administrators wishing to utilize the latest technological advances into their communities. The integration of computers and technology into society has always brought doubters as well as advocates into the discussion. "With the introduction of each new wave of innovation in mass media throughout the twentieth century - film, radio, television - debates on the effects of new technology have recurred, especially with regard to the effect on young people" (Wartella & Jennings, p. 31).

A number of concerns have been raised in opposition to the integration of technology into schools. Pfaffman (2008) contended that although modern technology moves at an alarmingly rapid pace, the effects of integrating these tools into educational and other environments are not immediately observable. He went on to suggest that the tools and their use must be widespread for a long enough time, so that users can fully take advantage of all that is present and possible.

Pfaffman reported that, however, with so much at stake for students, educators, and indeed the nation at large, investors are not likely to extend support while waiting for observable results.

A solid commitment to funding is another major issue discussed in research (Allen, 2008). Computer technology is constantly being updated in every aspect. Consider hardware, software and Internet connectivity. What was brand new and cutting edge even as little as two years ago is now virtually obsolete. Additionally, as these updates are occurring, teachers require training to keep up with the advances (DiBello, 2005). DiBello found that for successful, long-term integration to be effective, schools must commit to funding to a variety of recipients over an undefined timeline. In addition, she reported that given the present volatile state of economic markets, it's no wonder that investors and policy makers are hesitant to provide funding without overtly discernable evidence suggesting that integration overwhelmingly assists instructors and learners.

Teacher complaints center on the fact that, more often than not, their workload increases as a result of computer integration (Brinkerhoff, 2006). Browsing and locating appropriate Internet sites to find research sources for students is extremely time consuming. Brinkerhoff's study suggested that instructors new to technology are apprehensive about bringing these tools into their classroom and do not wish to bother and subsequently increase the workload of technology professionals on staff. Additionally, dependence on computer equipment can be a concern, which leads to extra preparation time spent ensuring that work is properly backed up (DiBello, 2005).

As computer technology begins to be integrated into school systems, a new type of lesson design known as project-based learning (PBL) is being woven into various curricula (Solomon & Schrum, 2007). PBL emphasizes learning through doing, and follows a student-centered model

of knowledge acquisition. Various educators see PBL as the future of instruction (Secretary's Conference on Educational Technology, 2000) because it empowers students to be the architects of their own learning by pursuing their own interests as opposed to following a scripted procedure. However, the 2001 No Child Left Behind Act mandated teachers emphasize test preparation in their lessons (Allen, 2008). As a result, schools competing for funding based in large part on the performance of their students on standardized tests cannot afford to pursue PBL through technology integration because their students require assistance in test preparation that is largely unavailable through PBL.

Advocates for Technology in Education

"No doubt we have come to a point in time when it is virtually impossible to ignore the need for technology in education" (DiBello, 2005, p. 239). Despite the hesitation on the part of opponents, there are many who feel that the benefits of technological integration greatly outweigh the negatives. For those arguing that cost is a deterrent from incorporating technology into schools, the Free Open Source Software (FOSS) movement attempts to combat the escalating expenses of software applications as well as the restrictions present therein (Pfaffman, 2008). According to Pfaffman, numerous *free* tools exist that are capable of meeting the needs of various educational environments and learning objectives. Additionally, the developers of FOSS encourage users to share and improve on their programs, thus allowing for learners to impact their own development by engaging with programming code. Pfaffman reported that one alternative for those worried about the cost of hardware and the frequent glitches present with new machines could make use of older, less powerful *thin clients*. "Thin clients are responsible only for displaying programs and taking input from the keyboard and mouse; the applications themselves run on the server" (Pfaffman, p. 29). By running "open" applications on one central

server, the possibility for hardware glitches and user error is greatly reduced. Additionally, the cost of purchasing, operating, and maintaining one server is minimal as compared to numerous, individual computers. The FOSS movement and Web 2.0 technology provide users with computer and Internet access the tools to effectively integrate technology into current learning and work environments.

> Web 2.0 is an invented term, coined in 2004. It encompasses the growing collection of new and emerging Web-based tools. Many are similar in function to desktop applications, with people using their browsers for access rather than installing the software on computers. Many tools are free and available to all, a change from applications that are purchased or licensed annually. (Solomon & Schrum, p.13)

Tools encompassed by Web 2.0 technology have the ability to positively impact the lives of a variety of users. With the integration of web 2.0 technologies, students attending schools in low resource environments can now have access and familiarity to applications whose use will aide presentation, organization and preparation for future employment (Solomon & Schrum, 2007).

The possibilities for ways to make use of technological tools in any level of education are endless (Selwyn, Gorard, & Williams, 2001). Research suggests that access to, use of, and proficiency with computers and the Internet, both at school and at home translates to positive academic outcomes (Judge, et al., 2006). "With 25 years of technological advances and some degree of successful technology integration throughout the curriculum, most practitioners have come to realize that technologies can be used to assist, support, or enhance *any* aspect of learning" (Allen, p. 609). High-speed Internet connectivity, with its limitless options and far-reaching spread holds particular awe for advocates (Selwyn, et al., 2001).

Summary

Today's students are developing in a fast-paced and exciting time. Technology surrounds them and is woven into many aspects of their lives. It has altered the state of education to the point where a new theory, connectivism, emerged in response to the changing landscape of instruction. Siemens' (2004) claims are so recent that their resulting impact on the field is yet to be determined. Modern theories such as connectivism must be woven into educational settings and used in hopes of solving current issues such as the digital divide.

When merely considering physical access to educational technology, research suggests that the digital divide has been lessened. Yet the achievement gap present in the U.S. threatens the future of the nation. Many at-risk communities are not receiving proper training and instruction on how best to make use of modern technology, thus rendering the recent increase in access irrelevant. Debate still continues as to whether or not incorporating technology into school systems is beneficial for all involved. Opponents have yet to be convinced that the benefits outweigh the costs, and are hesitant to commit to long-term funding. Furthermore, the emphasis on assessment of current public education detracts from the desire to incorporate technology into the classroom. Schools and districts compete with one another for funding. Proponents argue that technology has become such a necessary aspect to modern life, that not to integrate computers into schools does a disservice, particularly when considering the future employment of today's youth. When considering the numerous changes that have resulted from the technological revolution, one must wonder how today's students can possibly succeed and compete without fluency in technology. The surge of online tools available for use by any audience addresses the need for access. However, the mere existence and availability of these

tools will not solve any problems. Knowledge of where to search for low-cost educational resources would greatly enhance the successful integration of technology into school settings.

Chapter III

As computers and the Internet continue to evolve and are woven more completely into daily life, interaction between nations and cultures is increasing. As this evolution occurs, technology skills are becoming increasingly more important in order to obtain employment. Many current U.S. job applicants do not demonstrate comfort and familiarity with modern technology. Furthermore, there is an abundance of highly capable candidates living abroad willing to work at inexpensive rates. These two notions coupled with the communication ease over large distances translate to the outsourcing of domestic jobs to foreign employees as seen in recent years. In order for this trend to be altered, current U.S. students must develop fluency with computers at an early age in order to compete internationally for employment at a later date.

A worrisome fact when considering these issues is that the digital divide present in the U.S. reveals discrepancies in access to technology between communities. Recent studies such as DiBello (2005) and Valadez and Duran (2007) suggest that although major strides have occurred recently in terms of bringing equity to digital access for the have nots, underserved communities are still lacking access to properly trained educators. For U.S. students to develop confidence with modern tools, communities need physical exposure to the equipment as well as properly trained educators knowledgeable in ways to best utilize modern technology for instruction.

Background on the Project

In the summer of 2008, the researcher of this project enrolled in a course focused on issues of the digital divide called *Technology and Diverse Learners*. Throughout the course, the researcher read about digital inequality present in the U.S., engaged in an online dialogue with classmates centering on reactions to the reading, and created projects and wrote papers on various online tools and digital communities.

This intensive course made a lasting impact, yet the researcher was left feeling empty. Energy and focus was spent examining issues, yet at no time throughout the term had he, or any of his classmates engaged in activities to overcome aspects of the digital divide. It seemed only natural that he should focus his field project on this topic and create a product whose attempt would be to address the challenge of combating the digital divide and raise awareness of the problem in attempts to bring about digital equity in the U.S.

Timeline of Development

At the inception of the field project in September 2008, the researcher knew he wanted to create a product to lessen the effects of the digital divide, yet was unsure what type of product to create. While meeting with his academic advisor early in the semester, the researcher decided upon the creation of a resource website in which users could access information on ways to bring technology to school systems. At the suggestion of his advisor, the choice was made to make the site interactive, in the form of a wiki, so that other users could contribute their own knowledge for all to share. While constructing a rough outline for the structure of the wiki, the researcher settled on what he considered to be the most appropriate structure for the presentation of information. During a class project, the decision to use Wikispaces, a wiki tool, was made and construction of the product was officially underway.

Throughout the creation process, the researcher chose the following six categories for inclusion and presentation of the information on the wiki: Hardware, Software, Webquests, Grant Information, Miscellaneous, and Reseach. Providing users information on how and where to purchase inexpensive hardware will help to bridge the digital divide by bringing physical access to underserved learning communities. The researcher wished to offer information on software for users to begin incorporating online tools into their teaching practices. Making

webquests available on the wiki demonstrates to users ways in which to use the Internet for instruction. Supplying various grant information will assist in bridging the gap by letting users know where to search in order to get access to funds allocated specifically for technology integration to schools and low-income communities. The miscellaneous section provides users with information and first steps toward pursuing their own form of technology inclusion, while the research area provides downloadable studies on various aspects of the digital divide.

When choosing what information to include in the wiki, the researcher continually pondered whether the inclusion of said informational links would aide in the digital divide being bridged. The researcher began the creation of the wiki by providing links to his graduate projects under the Webquest section. These completed lessons were already hosted online, and provided a good place to start as the design of the wiki took shape. Next, the researcher investigated published articles to find links to programs and other useful information worth including. He accessed the sites to determine whether or not each was appropriate for inclusion as well as to check to current URL address. Additionally, the researcher provided links to information given to him by his advisor and other graduate professors and colleagues. Some of the resources led to other secondary sources, which were also included. After a meeting with his academic advisor, the researcher chose to include downloadable text files of published studies that informed the creation on the wiki. Ultimately, the researcher relied on Google's search engine to support locating information to include in the product.

After providing active links to all the various resources and informational websites, the researcher briefly explained each link in a few words in order to assist users in the navigation of the wiki. The researcher then organized the wiki site using bulleted lists under the six main categories. He then inserted anchors to his site to enable efficient navigation depending on user

preference.

Components of the Project

During this semester, the researcher was introduced to connectivism, an emerging learning theory. The main tenet of connectivism states that facts and information are constantly being updated as a result of modern technology. Connectivism additionally asserts that knowing *where* to search in order to access information is extremely important given today's technologically driven society. By taking the idea of connectivism and applying it to the issues present in the current U.S. digital divide, the researcher's goal is for his wiki to be an ever-expanding resource for those hoping to bring technology into their own school systems.

Chapter IV

The purpose of this project was to develop a reference point in the form of a wiki for educators hoping to integrate technology into school systems and curricula, as well as share resources of their own in hopes of bridging the technology gap that exists in U.S. educational settings. Research suggests that there exists a need for teachers as well as students to develop comfort and familiarity with current technology, and that computer fluency on the part of students will assist in their preparation for future employment. The researcher addressed this need by including links to a variety of resources, which, if properly integrated, will positively affect school settings, teaching practices, as well as student learning and skill acquisition.

Guidelines for Implementation

There exists no uniform answer, nor proper timeline for effective technology integration into schools. Similarly, there is no exact timeline for the implementation of the product associated with this field project. Technology integration is individual and should occur based on needs, funds, and calendar of the school or district. However, the earlier the tools presented within the product are accessed and utilized, the sooner educational communities will feel the effect. Proper care for the efficient, structured implementation should be taken to ensure the time, effort and funds by anyone associated with technology integration are not wasted. Each district and school site has its own set of specific needs, issues, and schedules to navigate through in order to properly integrate technology. Because of the complexity of effectively incorporating technology into school settings, the researcher developed a wiki site to address the variety of layers and levels of technology integration.

Educators interested in gathering information on the digital divide and its effects on schools should navigate to the *Research* section of the wiki. Various research articles used

during the literature review chapter of this field project are available for download. After reading the publications, interested parties could then choose to access other areas of the wiki site in order to retrieve the most relevant information to meet their school's specific needs. The wiki is designed so that others can also contribute to the resources available from the site, building a shared community of resources.

Administrators searching for funding to bring technology to their school site should navigate to the *Grant Information* portion of the wiki. Listed in this section are links to informational websites for a number of educational grants as well as non-profit firms providing funding to bring technology to school settings. Once appropriate resources are obtained, those looking to purchase inexpensive machines should access the *Hardware* section of the wiki. Background information as well as retail locations for *thin clients* are present there. Thin clients are a series of inexpensive basic monitors, keyboards and mice whose applications are run from a separate central server. The simple setup allows for fewer instances of user error and costs less to operate than individual computers.

Classroom teachers wishing to utilize tools originating from the Free and Open Source (FOSS) movement should navigate to the *Software* section of the wiki. Background information on the genesis of the movement as well as links to downloadable programs are available in this section of the site. Moving beyond the acquisition of software, teachers wishing to bring the Internet into their curricula should access the *Webquests* section of the wiki. Links to free, online lessons for numerous grade levels and topics are present.

Lastly, individuals without specific integration needs for their own schools, but with an interest in a variety of information on education and technology should access the *Miscellaneous*

area of the wiki. Links to a variety of resources are presented within this section ranging from the digital portfolio of the site author to educational conference links.

The researcher presented the information on the site in what he believed to be a logical order for various educational needs. However, users must decide for themselves which portion(s) of the wiki most suitably meet their needs, then develop their own plan for successful integration. Like student learning, technology integration is individual. Implementation of the tools presented in this product must be handled individually for successful outcomes to occur.

Methods for Evaluation

Evaluating this type of product is not an easy undertaking. The wiki's layout merely presents users with a variety of resources and information. What results from accessing the information is up to the educator who navigates to the site. The researcher cannot feasibly track users and visit each of their individual schools sites to gage the effectiveness of his product. Instead, the researcher developed an optional user questionnaire and hosted it on surveymonkey.com. The questions present users with the option of providing feedback and insight into their use and perceived effectiveness of the resource wiki. Based on user feedback, the researcher would make adjustments and additions to the content of the site.

Another way to assess the usefulness of the site is to track the additions and modifications made by those not associated with the original site construction. If new users add their own resources to the site and revise outdated information, the researcher could conclude that, at the very least, the product is being viewed and improved upon by colleagues and therefore affecting some sort of change in educational communities (or at least contributing to the usefulness of the resource).

Limitations of the Project

The number of resources available to users with ready access to the Internet is extremely vast. One limitation when considering this project is that the researcher was only aware of a finite number of sources during site construction. There are numerous areas for further exploration that he may have overlooked during the creation of this project. Furthermore, the Internet is not stagnant, but rather an evolving entity. New sites, tools, and programs are being created and released on a daily basis. The resources presented on the wiki, while considered cutting edge and effective during site construction will undoubtedly become obsolete in the future. Additionally, given the unstable state of the U.S. economy, the availability and size of the grants, as well as the mere existence of the non-profit firms presented in the wiki are not certain.

Conclusion

The goal of this project was to provide resources for educators interested in integrating technology into schools and curricula in hopes of lessening the digital divide present in the U.S. The information is presented on a wiki site, suggesting that any user can access the resources and contribute to them. Given the indications of recent studies, the researcher provided links to tools that can make possible and ease the transition of technology integration. Hopefully many users will navigate to the site, take advantage of the opportunities present, and post their own additions.

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Aaron J. Brill's Digital Divide Resource Wiki

Image taken from: http://staff.bbhcsd.org/schinkerj/archives/2006/08/

"Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime." - Chinese proverb

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This site was created to provide information and resources for the integration of technology in school settings for all educators. The hope is by *connecting* educators to resources, the digital divide might be lessened with the implementation of

various tools. Please feel free to comment and/or add relevant information to the site. Thanks for getting involved!

Site Navigation:

Hardware | Software | Webquests | Grant Information | Misc | Research

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Hardware:

Schools and districts may consider purchasing *Thin Clients* instead of full CPU's or laptops in order to cut down on overhead costs, maintenance, and carbon emissions. Below are links to information on *Thin Clients* and where to purchase such systems.

Information:

- Wikipedia entry on Thin Clients - Basic information on what Thin Clients are, examples, and advantages of use
- Open Thin Client - home - Free Open Source ThinClient Solution - site includes sections on why, safety and security, green issues
- openthinclient.org's philosophy - Why Thin Clients are appropriate
- When to Consider Thin Clients - HP's answer to the linked question

Purchase:

- thinlabs $99 Thin Clients available - thinlabs' products available online starting at 99$
- Ubuntu Thin Clients - html version of a pdf outlining Ubuntu Thin Clients
- Wyse Technology - Thin Clients - Wyse Thin Clients and Zero Clients available for purchase online

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Software:

Many software developers are creating free and open source software (FOSS) as an alternative to purchasing costly, licensed software. Included below are links to information on the FOSS movement and various examples for use.

Information:

- A Brief History of FOSS - Jesus M. Gonzalez-Barahona's concise description of FOSS, written in the year 2000
- Free Open Source Software Wikipedia entry - Wikipedia's entry on FOSS

Examples for Use:

- Moodle home - FOSS class management system
- Edubuntu - Edubuntu is a complete Linux-based operating system, freely available with community based support.
- FOSSweb - Science Curricula
- SourceForge.net - FOSS site to create and share projects and information
- zoho writer - free online word processing
- numsum.com - free online web spreadsheet
- tuxpaint.org - open source painting tool
- audacity - free audio recorder and editor
- delicious.com - social bookmarking
- wikispaces.com - wikis for all (this site was created using wikispaces)
- blogger.com - free blogs for any user - very easy to setup and use
- google earth - very powerful free tool for geography instruction
- Google SketchUp - graphics creator - great for geometry

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Webquests:

Webquests are digitally based lessons. Below are several links to examples that can be used in a variety of curricula.

- Some Thoughts About Webquests - by Bernie Dodge from San Diego State University
- Webquest.org home - links to free webquests
- Best Webquests home - links to free webquests

Created by the site author:

- Entire curriculum based on landmarks in San Francisco - 10 lessons on the history of San Francisco Landmarks with varying products
- Singular lesson on the Ides of March - Online lesson for middle schoolers with a brief essay as the product outcome
- Singular lesson on the stock market for middle schoolers - Online lesson for middle schoolers with a fact poster as the product outcome

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Grant Information:

Below are links to grant information in order to request funding for your school or district.**

- Technology Grant News home - This site provides current information on technology grants and is frequently updated
- Kids in Need home - This foundation provides grants for technology integration to assist with childhood learning
- San Francisco Technology Grants - This local initiative provides funding for low income and disadvantaged residents to boost technology use
- Beaumont Foundation of America - This nonprofit is dedicated to assisting the less fortunate children and youth, families and the elderly
- Bill and Melinda Gates Foundation - Microsoft creator's foundation, "All lives have equal value"
- NEA Foundation - Provides grants for economically disadvantaged students
- Salesforce.com's Turn It Up Grant Program - This business that provides funding for the implementation of their CRM product for social change
- google.org's Grant List - Google's non-profit foundation

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Misc:

Below are links to various educational technology or community building sites.

- google verification index page
- Aaron J. Brill's Portfolio Site - digital portfolio of the site author
- Technology in Education home - Links to various educational resources for the implementation of technology into education
- Educational Wiki List - Links to various wiki sites, similar to this page
- Center for Comprehensive School Reform and Improvement - site built on improving school systems
- Apple Learning Interchange - Resource Home - Apple's educational resource site
- Microsoft Education - Microsoft's educational resource site
- Ed Tech Action Network - group moving toward the goal of digital inclusion
- State Educational Technology Directors Association - Community building site for state tech directors to interact
- Community Technology Centers Network - this attempts to improve social, economic, educational, and cultural life through technology
- Altec.org - free online educational tools
- Ning - create your own social network, for anything
- Techlearning.com - information and resources for teachers, tech directors and administrators
- The Conference Calendar - nationwide conference specifics
- Educause.edu - mission is to advance higher education by promoting the intelligent use of information technology
- teachinginterchange.org - site to assist new teachers in best practices
- k12onlineconference.org - Educational technology conferences
- Online teacher training - Teacher training through podcasts
- teachertube - youtube's teachertube features videos relevant and appropriate for classroom use
- libweb.org - National library list for free access
- cyberlearning.org - testimonials about the digital divide

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Research:

Below are links to research conducted on the digital divide.

- Divide or Opportunity.pdf - Selwyn, Gorard and Williams' 2001 study
- Educational Policy.pdf - Warschauer, Knobel and Stone's 2004 study
- dibello.pdf - Dibello's 2005 study
- Closing DD (elementary).pdf - Judge, Puckett and Bell's 2006 study
- Redefining DD.pdf - Valadez and Duran's 2007 study

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Welcome to my resource wiki! My name is Aaron Brill. I am a teacher living and working in San Francisco. Throughout my graduate studies, I became interested in attempting to combat the digital divide present in the United States. The construction of this wiki is my own attempt to do so.

Click here to take an optional survey

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