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### Abstract

While a “new teacher education” has evolved over the past several years in the United States, in large part as a response to the accountability and standards movements in public policy as well as academic circles, formal preparation programs for the classrooms of the twenty-first century have generally failed to embody the knowledge, skills, and dispositions needed for the development of digitally literate students and netizens. Three “digital definers” are making a loud and persuasive case for fundamental changes in the way teacher education programs prepare students for the classrooms of today and tomorrow. The presence of digital natives in our schools, the availability and growing ubiquity of access to digital curriculum, and the expectations for digitally literate graduates and workforce members should define the shape of the new teacher education.

## Digital Definers of the New Teacher Education

Writing at the dawn of the industrial revolution, John Dewey astutely observed:

With the advent of democracy and modern industrial conditions, it is impossible to foretell definitely just what civilization will be twenty years from now. Hence it is impossible to prepare the child for any precise set of conditions. To prepare him for the future life means to give him command of himself; it means so to train him that he will have the full and ready use of all his capacities; that his eye and ear and hand may be tools ready to command, that his judgment may be capable of grasping the conditions under which it has to work, and the executive forces be trained to act economically and efficiently. It is impossible to reach this sort of adjustment save as constant regard is had to the individual's own powers, tastes, and interests—say, that is, as education is continually converted into psychological terms. (Dewey, 1897)

Sadly, in the morning hours of the information age in the early twenty-first century, the psychological terms of primary, secondary, and post-secondary education in many parts of these United States are narrowly and oppressively defined for many students. Formal educational experiences are viewed primarily as instrumental exercises with the sole purpose of achieving high test scores. The quality of both education and the teachers whose responsibility it is to engage students in educative experiences are singularly defined by a policy-driven perspective on measurable student achievement outcomes. Rather than preparing students for their complex and increasingly technological futures, schools continue to prepare students for a past with which their teachers and administrators are intimately familiar. (Warlick, 2005)

The pace of change wrought by technological, economic, and cultural forces in the early twenty-first century is dizzying. These changes are most pronounced in the developed world, but are increasingly apparent in the developing world as well (LaFraniere, 2005). Ours is a manic society rapidly changing in fundamental ways, especially with regard to the availability of and ubiquitous access to digital information and communication technologies. Amidst this sea of

change, educators and their predominant classroom practices generally remain consistently traditional (Cuban, 2001). Content focused, teacher directed, didactic instruction focused on content memorization and regurgitation on cue remain the rule of the day. Teachers entering the educational workforce consistently report minimal preparatory experiences with technology integrated lessons or formal digital literacy development in primary and secondary educational settings (Cavanaugh, 2005). Since teachers tend to teach as they were taught, our instructional workforce is understandably ill-prepared to meet the increasingly digital demands of the twenty-first century knowledge landscape as well as the digital skill expectations of prospective employers.

Writing in the October 2005 edition of *Educational Researcher*, Marilyn Cochran-Smith provides a superb overview of the evolution as well as devolution of teacher education programs in the United States over the past several decades. She identifies three new trends that have helped construct “teacher education as a policy problem,” a relatively new phenomenon now commonly understood in our present age of No Child Left Untested:

1. Faith in state and federal policy as the key to solving the problem of teacher education;
2. The desire (at least rhetorical) to establish policy based on sound research;
3. ...the inclusion of policy as a major part of the discourse within the teacher education community itself. (Cochran-Smith, 2005)

This policy-focused approach toward “solving the teacher education problem” and eventually improving measured levels of student academic achievement fails to both acknowledge the complex nature of teaching and learning, and address the vital need to prepare both students and teachers to be digitally literate netizens in our post-industrial society and economy.

The need to transform and redefine our educational paradigms in the twenty-first century and help students develop digital literacy skills was captured well in the report of The Partnership for 21<sup>st</sup> Century Skills. Their report noted:

Today's education system faces irrelevance unless we bridge the gap between how students live and how they learn. Schools are struggling to keep pace with the astonishing rate of change in students' lives outside of school. Students will spend their adult lives in a multitasking, multifaceted, technology-driven, diverse, vibrant world—and they must arrive equipped to do so. We also must commit to ensuring that all students have equal access to this new technological world, regardless of their economic background (Partership for 21st Century Skills, 2002).

To explore and highlight this need for digital literacy development in educational institutions including teacher preparation programs, in this paper I will define digital literacy and offer an updated digital context for framing discussion and policy recommendations concerning the “new teacher education.” In his book, *The World is Flat: A Brief History of the Twenty-First Century*, New York Times columnist Thomas Friedman explored ten “flatteners” that are redefining our economy and culture (Friedman, 2005). In our technologically robust environment, three “digital definers” highlight the critical need for a paradigm shift in teacher preparation programs embodying the realities and needs of digital literacy acquisition. These include:

1. The omnipresence of digital natives in twenty-first century classrooms.
2. The near-ubiquitous access to digital curriculum for twenty-first century learners.
3. The expectations of educational organizations and commercial employers for digitally literate graduates and employees in our post-industrial economy.

Hopefully by examining these three “digital definers” in turn, both students and active political architects of our present and future educational landscape can gain much-needed perspectives on digital literacy that can inform both policy about and practice in the classrooms of today and tomorrow.

### *Defining Digital Literacy*

Literacy is a dynamic concept which reflects the evolving knowledge landscape in both the availability and actual uses of information (Bundy, 2002). Digital literacy is closely associated with “information literacy,” a skill and concept summarized well in “A Progress Report on Information Literacy: An Update on the American Library Association Presidential Committee on Information Literacy: Final Report.” It summarized the original 1989 report’s focus on the definition and importance of information literacy acquisition for all members of society. That report:

- explained the enormous impact of the information explosion **on all people**: in their individual lives, in their businesses, and even in their functions as American citizens.
- emphasized repeatedly **the need for all people** to become information literate, which means that they are not only able to recognize when information is needed, but they are also able to identify, locate, evaluate, and use effectively information needed for the particular decision or issue at hand. **The information literate person, therefore, is empowered for effective decision making, freedom of choice, and full participation in a democratic society.**
- stressed that this nation's **economic independence and quality of life was becoming increasingly dependent** on all of its citizens becoming lifelong learners—something that would have to start with a basic change in the way young people learn. "To respond effectively to an ever-changing environment," the report concluded, "people need more than just a knowledge base, they also need techniques for exploring it, connecting it to other knowledge bases, and making practical use of it. In other words, the landscape upon which we used to stand has been transformed, and we are being forced to establish a new foundation called information literacy. (American Library Association, 1998)

These recommendations and perspectives have been a common rhetorical feature of educational policy and reform discussions in recent years, but have not been actualized in most K-12 classrooms or teacher preparation programs to date. The measuring sticks of both primary and secondary student performance, as well as teacher education programs, have been narrowly defined by student test scores. Marilyn Cochran-Smith correctly observes “...the reductionist

version of outcomes—that is, relying entirely or almost entirely on pupils’ test scores as the way to evaluate teacher preparation—is highly problematic” (Cochran-Smith, 2005). One symptom of this problematic formula is the general lack of focus within K-12 classrooms on anything other than test score improvement, including digital literacy skill development. This need for information literacy / digital literacy development may be tacitly acknowledged, and even included in formally published content area standards, but has here-to-fore been generally ignored in our devolving educational culture myopically obsessed with multiple-choice examination results.

The National Forum on Information Literacy, created in response to the aforementioned 1989 ALA report, defines “information literacy” as:

The ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand. (National Forum on Information Literacy, 1989)

The effective use of information is further emphasized by use of the term “digital literacy.” Our knowledge landscape is not only defined by an overwhelming quantity of information, but by the increasingly digital nature of that information. As Neil Postman observed in “Technopoly: The Surrender of Culture to Technology,” information overload began with Johann Gutenberg’s invention of moveable type in Europe in the mid-1400s (Postman, 1992). What qualitatively distinguishes both the informational environment of the twenty-first century as well as the literacy skills required to survive and thrive within it is the predominantly digital nature of information and the digital methods by which it is accessed, remixed, and communicated.

I offer, therefore, the following definition of digital literacy which both subsumes and extends more traditional and limited conceptions of information literacy:

Digital literacy embodies the abilities to appropriately access, validate, synthesize, and utilize both analog and digital information sources to achieve a defined

purpose. Digital literacy includes the abilities to communicate and collaborate effectively with information, transforming it into knowledge through a process of authentic and contextual utilization.

Digital literacy should be understood as a requisite set of skills extending beyond a librarian's defined skill set for research paper authorship. Digital literacy cannot be fully acquired in isolation, preparing traditional written reports, but instead must be obtained through a transformative process of "authentic and contextual utilization." Experience is the most powerful teacher, and has no substitute when it comes to developing and refining the skills of digital literacy or any other type of literacy (Dewey, 1938).

Technology immersion, where every learner and teacher is equipped with a portable, wireless electronic device capable of accessing Internet content and enabling a wide range of digital collaboration methods across time and space, is the future of education. As former Maine Governor Angus King quipped in a speech before educators in April 2005, politicians arguing about the value of purchasing laptop computers for students to access digital curriculum today will soon be in nursing homes reflecting about how silly that "laptop debate" in the early twenty-first century was.

In many ways, this is a ridiculous debate [over renewal of the Maine Learning Technology Initiative.] Of course every child in America is going to have a digital device at his or her desk. Of course. We'll all get together at the nursing home and laugh about that quaint debate we had in Maine about laptops. "Can you believe that we had that argument?"... Of course it is going to happen... This is really urgently about the future of our children. We have got to equip these children with the skills and the tools to compete in this new flat world. If we don't we have failed the most basic responsibility of parents: which is to give our children the skills and tools to survive. As Friedman says, if we don't continually upgrade and drastically upgrade the skills of American children right now, all they're going to have are lousy jobs... Our children are going to look to us and say, "What did you do on the flat earth Daddy?... We have got be able to look them in the eye and say, "We did something about it. We gave you the tools or we worked to give you the tools" (Sprankle, 2005).

As the price point for powerful, wireless, mobile computing devices continues to decline, broad educational adoption of these technologies is not only likely, it is an eventuality. The non-profit association, One Laptop per Child (OLPC), has been created by the Massachusetts Institute of Technology and other partners to accelerate this adoption process. In October 2005, Nicholas Negroponte, founder of the MIT Media Lab, announced the cost of the displays for these \$100 laptops has already been reduced to \$45, and the target manufacturing cost for the display will be \$35 (MIT Media Lab, 2005). Typically, a laptop's display is the most expensive component of the computer. The \$100 laptops are scheduled to ship en masse to Ministries of Education adopting national policies of technology immersion for every student, in every school, by late 2006 or early 2007. Technology immersion is a fast-approaching reality for learners and teachers. The time to prepare is now.

*Digital Definer #1: Digital Natives*

If we think of digital information in our world as a vast sea which surrounds and threatens to overwhelm us, people of older generations can be thought of as land creatures who can adapt moderately well (if they choose to do so) to aquatic life. Younger generations, however, raised in this ocean of digital information and technological access, are like fish in the water. Naturally adapted to their digital environment, these creatures find life outside the sea of digital information and technology novel and unfamiliar. Different perspectives on information access are natural for the "Net Generation," who assimilate new technologies rather than accommodate them because they have not known a different reality (Tapscott, 1998).

Mark Prensky coined the terms "digital natives" and "digital immigrants" to describe the generational differences which now define learners from many of their older teachers. Writing

four years ago, Prensky noted “Our students have changed radically. Today’s students are no longer the people our educational system was designed to teach.” The Internet, instant messaging, video games, and computers form a substantial part of the “native language” of digital natives (Prensky, 2001). While digital immigrants can adapt and learn to swim in this digital sea, it is the digital natives who seem to have the upper hand on the learning curve. Sadly, a dichotomous categorization of people as digital natives and digital immigrants may be inadequate. As Patricia McGee has noted, a third category of “digital foreigners” may also be required to describe those people who are not only uncomfortable in the digital waters, but refuse to swim at all and seek at every opportunity to return to the comfort of their land-based, non-aquatic (non-digital) existence (McGee, 2005). Unfortunately, many tenured professors in our colleges and universities may fit more accurately into this latter category of “digital foreigner” rather than “digital immigrant.” Yet thankfully their proper categorization remains a choice and act of the will. Many may yet be persuaded to change and remain relevant.

Teacher education programs must acknowledge and adapt their instructional programs to the realities digital natives in the classroom present. The ECAR 2005 study estimates that of the entire US teenage population (not limited to just those in college or bound for college,) 87% use the Internet, 51% use it daily, 81% play games online, and 76% access online news sources. A majority of US teenagers with home Internet access have broadband access, and nearly one-fourth report preferring IM (instant messaging) to either phone or email communication technologies (Kvavik & Caruso, 2005). In the forward to the report, Richard Katz encourages all educators to:

...take it to be self-evident that college-bound digital natives are in fact digital cognascenti, sophisticates, and perhaps even digital connoisseurs who will arrive at our nation’s institutions of higher learning with digital gadgets of every imaginable shape and function, with insatiable appetites for all things digital, and

with limited patience for the charming but antiquated artifacts of the analog academic world.

“Education as usual” does not and will not engage the minds, aptitudes, and proclivities of digital natives in the twenty-first century classroom.

A key question needs to be addressed, therefore, by teacher education programs nationwide. How can teachers learn, acquire and refine their knowledge, skills and dispositions to effectively engage and challenge learners to extend their own digital literacy abilities? The ECAR 2005 survey of over 18,000 students attending sixty-three different U.S. colleges and universities suggests that these digital natives do not want to forgo face to face learning opportunities entirely and obtain their educational degrees in a wholly online and electronic format. Rather, students report a desire to more consistently utilize course management systems (CMS) and moderate levels of educational technology tools in their classes. Some observers falsely assume all digital natives are digitally literate, and the ECAR 2005 report supports the falsehood of this perception. Students need help developing their capacities to access, analyze, and critically utilize digital information in a variety of contexts. Like a fish born with the ability to breathe underwater, but perhaps not with the knowledge and skills to effectively hide from predators or obtain food, students DO need the expertise of more experienced mentors.

If teacher education programs fail to reinvent themselves and adapt to the digital natives which now fill classrooms, our national hopes for providing digitally literate teachers in K-12 settings who can structure pedagogically appropriate learning environments and assign valid tasks requiring information synthesis as well as knowledge construction will be minimal. Teacher education programs are our best hope for preparing tomorrow’s teachers to effectively develop the digital literacy capacities of our students.

An analogy to US military service academies is fitting for this situation. One of the goals of Westpoint, Annapolis, the US Air Force Academy, and the US Coast Guard Academy is to inculcate high ideals of honor, service before self, and self-discipline in their graduates who move on after a formal four year educational indoctrination to serve as officers and leaders in a variety of capacities. If value orientations such as these could be imparted in an “alternative certification” or commissioning format, then the nation could save thousands of dollars each year disbanding these institutions. Yet the institutions remain and are preserved, in large part because their value in developing character through sustained and shared experiences is recognized as valid.

Similarly, teacher education programs must adapt to not only engage digital natives in authentic and challenging educative experiences utilizing available technologies, but also prepare their pre-service teacher candidates to replicate modeled pedagogies of technologically integrated and immersed learning. If one to one laptop initiatives will be the norm rather than the exception in the classrooms of tomorrow, every teacher education program should be embracing laptop immersion projects as a necessary and inevitable evolutionary step in their historical development. Providing laptop computers for or requiring their purchase by every student and faculty member is only the tip of the iceberg, however, in accommodating the changing environment ushered in by digital natives. The adaptation and transformation of traditional learning tasks to new ones reflecting the realities of our digital information environment and the need to develop digital literacy skills is a much greater and formidable challenge.

The motto of the popular website [schoolsucks.com](http://schoolsucks.com) is “download your workload.” If digital natives are not challenged with robust learning tasks requiring them to authentically demonstrate their learned knowledge and skills—in ways that cannot be faked or “downloaded,”

then our educational institutions are failing in their fundamental mission to prepare students for future success. Our economic vitality and security as a nation will not hinge on our graduates' abilities to regurgitate content on cue or merely access a mind-blowing universe of digital content, but rather on their abilities to creatively think and problem solve in dynamic and unpredictable circumstances we can barely begin to imagine.

### *Digital Definer #2: Digital Curriculum*

The ubiquitous presence of digital natives in our classrooms is only the first of the digital definers mandating transformational change in teacher education programs. Digital content and communication tools are “flattening the world” and removing communication barriers that have existed since the beginning of recorded history. The availability of this digital curriculum and web-based resources for collaboration also cry out for both recognition of our rapidly changing knowledge landscape, and the need for teacher education programs to prepare students differently for their future.

In a recent feature article for *Interactive Educator* magazine, “The Digital Face of 21st Century Curriculum: How digital content is changing teaching and learning,” I describe in detail how many of the same “flatteners” identified by Thomas Friedman in *The World is Flat* as transformative of the face of international business are also changing educational curricula in basic ways (Fryer, 2005b). Although digital foreigners along with many digital immigrants may bemoan this trend, we have entered an age where, in order to be globally relevant, content must be digital. Increasing numbers of students with access to the Internet at home go to online sources first when investigating a research question (Carlson, 2002). The Google search engine, along with other sources of indexed Internet content, place an unimaginably diverse world of

information literally at the fingertips of every Internet user. This increasingly ubiquitous availability of content represents a fundamental shift in educational curricula and the corresponding role of schools as well as teachers.

During all previous periods of recorded history, simply obtaining raw informational material for a research project was often a forbidding task in itself. This process usually required physical trips to a library, large quantities of time spent searching card catalogs, and then more time chasing down actual books, microfiche slides, or other analog materials which hopefully contained text helpful to the research task at hand. The informational environment accessible to today's student is both qualitatively and quantitatively different by several orders of magnitude.

Challenges for today's students and teachers lie not in the access and availability of potentially relevant information, but in the process of identifying the sources and validating the veracity of obtained information. A simple Google search for the name Martin Luther King results in over 25 million page results, but the third result (in October 2005) is the website [www.martinlutherking.org](http://www.martinlutherking.org) owned and maintained by the self-proclaimed white supremacist group Stormfront ([www.stormfront.org](http://www.stormfront.org)). Despite the proliferation of educational search engine filtering schemes designed to protect the eyes of the innocent from offensive, false, and vulgar content, the informational environment of the twenty-first century is a confusing morass of voices that demands with even greater volume than in previous decades the need for saavy, independent, critically thinking students who can ideologically separate the proverbial wheat from the chaff.

Since our educational paradigm shifted from a learner centered, more Socratic method to a factory production line, content and regurgitation-encouraging model, schools have attempted to impart an impossibly large and ever-growing body of content to learners. This behemoth of

information is fondly referred to as “the curriculum,” and also includes a varied set of skills and dispositions. As the school accountability movement has gathered steam over recent decades, policymakers along with many educators within our institutions have placed a seemingly limitless faith in the ability of curriculum standards and administered assessments to improve both the delivery of curriculum content and its acquisition by learners. This model has been thoughtfully characterized by Jonathan Levy as “just in case” rather than “just in time” education (2005). As the scope, breadth and depth of digital information accessible to learners continues to grow in the future, the importance of helping students learn how to think critically, problem solve effectively, and articulately communicate with diverse audiences using multiple modalities will become increasingly apparent.

Our dramatically evolving knowledge landscape and its implications for digital curriculum are reflected well in the growth of the Wikipedia. The origin of what has become the world’s largest and fastest growing encyclopedia of information can be traced to January 15, 2001, when the “Nupedia” project was renamed and relaunched using “WikiWeb” technology permitting anyone with a computer and access to the Internet to contribute to the project. A standard encyclopedia has approximately 30 volumes and contains about 60,000 articles. Because of its analog nature, printed encyclopedias are inherently limited in both the scope and depth of content they can contain. By contrast, in October 2005 the Wikipedia’s English version boasts over 700,000 articles, more than ten times the amount contained in a typical printed encyclopedia. According to the current “About Wikipedia” page:

There are 13,000 active contributors working on over 1,800,000 articles in more than 100 languages. As of today, there are 798,134 articles in English; every day hundreds of thousands of visitors from around the world make tens of thousands of edits and create thousands of new articles to enhance the amount of knowledge held by the Wikipedia encyclopedia. Visitors do not need any special

qualifications to contribute, and people of all ages help to write Wikipedia articles (Wikipedia Contributors, 2005).

Standard educator / digital immigrant responses to the Wikipedia include statements like, “That cannot work!”, “Who is checking for the accuracy of the content?”, and “We can’t have our students using a reference like that!” Yet the Wikipedia has evolved into a self-policing community that DOES work, and both the breadth and depth of digital content available on its websites alone is both breathtaking and paradigm-challenging to contemplate.

The availability and proliferation of digital curriculum is redefining the economics of ideological control and distribution. During previous informational epochs, when “old media” forces prevailed and elite gatekeepers were in control of the means and channels of publication, the economics of information dictated that close control of the access and distribution of content was essential for both profitability and future value. In our evolving digital knowledge landscape, however, this old assumption may not be true in many cases. If content must be digital in order to be relevant, because digital content is predominantly or exclusively preferred by digital natives, then free access to that content may also be appropriately viewed as necessary to its relevancy and value. Stated in other terms, if a content publisher wants his/her ideas to have value and be discussed in the marketplace, the most logical course of action when publishing those ideas is to give them away for free online.

Disintermediation is the process of removing an intermediary, or middleman, from a given chain of steps. The publication of both text and audio content has now been disintermediated from traditional publishing gatekeepers, thanks to the impact of disruptive technologies like blogging and podcasting. We live in an evolving informational environment where literally anyone can be a global content publisher, as well as content consumer. In order to acquire and refine the skills needed for digital literacy, students of all ages need to engage in the

active production as well as consumption of multimedia content (Fryer, 2005a). The availability of digital curriculum for twenty-first century learners should have a dramatic impact on the way teacher educators prepare tomorrow's classroom leaders. To stay the course in the face of such systemic change would be not only a denial of reality, but also an invitation to the club of educational and occupational irrelevancy.

### *Digital Definer #3: Digital Expectations*

The final digital definer highlighting the need to transform the predominant paradigm of teacher education in the early twenty-first century is digital expectations. In content area standards, graduation requirements, and employee prerequisite lists, digital literacy skills are common. Yet despite the formal existence of these standards, as previously discussed, there is a wide gap between these expectations of teacher and student behavior and actual classroom praxis.

The International Reading Association's official position statement on "Integrating Literacy and Technology in the Curriculum," for example, contends "students have the right to:"

- Teachers who are skilled in the effective use of ICT [Information and Communication Technologies] for teaching and learning
- A literacy curriculum that integrates the new literacies of ICT into instructional programs
- Instruction that develops the critical literacies essential to effective information use
- Assessment practices in literacy that include reading and writing with technology tools
- Opportunities to learn safe and responsible use of information and communication technologies
- Equal access to ICT (International Reading Association, 2001)

Rather than be a conservative voice advocating for strict adherence to traditional methods of reading instruction, the IRA has defined itself as a progressive and forward-thinking organization

attuned to the needs of digital natives and their teachers. This concise but visionary publication goes on to address needs for “expanding our conception of literacy” and acknowledging the implications of these trends, needs, and contentions:

- The Internet is rapidly entering nearly every classroom in developed nations around the world.
- Equity of access to Internet and other ICT will ensure literacy opportunities for children around the world.
- Providing adequate education and staff development will ensure that each teacher is prepared to effectively integrate ICT into the curriculum.
- Teacher education programs can play a critical role in preparing teachers for using the new technologies of literacy in the new classroom.
- Creative initiatives to increase access, provide staff development, and support teacher education should be supported by professional literacy organizations.
- We must pay particular attention to developing the critical literacies these new technologies demand.
- To adequately evaluate students’ literacy achievement, reading and writing assessment must include the new literacies that are central to our students’ future.
- An intensive program of research on literacy and technology issues will enable us to better understand the rapid changes taking place in the nature of literacy and literacy instruction.
- The current public policy debates on reading instruction must address a central point: When students complete their school careers, much of their reading will take place within ICT such as the Internet (International Reading Association, 2001).

This final observation reflects an often missing “link” between formal educational organizations and the real world outside their walls. Schools should be engaged in the process of not only preparing students for life, but also preparing them for the world of work. That world is increasingly influenced, shaped, and defined by digital information and computer technologies. Schools which fail to adequately prepare students for vocational success in this environment belong in the twentieth century, not the twenty-first.

Representative of this need and the expectations of employers to hire digitally literate graduates were statements included in “A Global Imperative: The Report of the 21st Century

Literacy Summit” convened in San Jose, California in April. In response to the question, “What does a world that values 21st century literacy look like?” report authors wrote:

The essential characteristic of this world is that it embraces 21st century literacy broadly. Communication is multi-dimensional, engaging, and increasingly unbound to text. Creativity is valued broadly, and success is associated with the ability to articulate ideas using not only words, but also images and sounds.

Education is optimized for multi-tasking and tailored to each learner. Schools incorporate the new literacies across the curriculum, and use them to more fully engage students, articulate ideas, and demonstrate concepts. New tools, easy-to-use and widely available, allow the skills imbedded in 21st century literacy to be refined throughout a child’s educational experience (The New Media Consortium, 2005).

Both the position statement of the IRA on technology and literacy as well as the report of the 21<sup>st</sup> Century Literacy Summit highlight the rhetorical support digital literacy acquisition has among a broad range of educational stakeholders.

Our conceptions of student achievement, teacher quality, and worthwhile educational experiences must be wed to these conceptions of digital literacy. A high quality learning environment in the twenty-first century is defined by far more than students preparing for and scoring well on standardized assessments. The educational outcomes we expect and demand in our classrooms must expand to also include the process skills of digital literacy. These include skills of problem solving, information validation, collaboration, and communication. Students at all levels, not just those classified as “gifted and talented,” must be engaged in higher order thinking scenarios challenging them to synthesize and sort out diverse and conflicting sources of information. Students must be regularly challenged to ascend the cognitive ladder of Bloom's taxonomy, regularly leaving the lower levels of knowledge and comprehension recall to more complex tasks of ideological debate and authentic knowledge construction. Students’

perspectives and opinions about the world must be challenged in creative and constructive ways, helping stretch their minds in directions they did not anticipate and have not experienced before.

Digital literacy has suffered from an expectations gap: a large difference in what is formally expected of students by the time they graduate, and the common activities with which much of their time in schools is wasted. The expectations of most educational stakeholders include the goal of digital literacy acquisition for students. It is time for teacher preparation programs, as well as the K-12 learning environments they serve, to walk the walk as well as talk the talk.

### *Conclusions*

The importance of acknowledging the existence and implications of these digital definers for teacher education and taking appropriate actions in response to this expanded worldview was articulated well by Angus King at the end of his previously cited April 2005 speech for Maine educators. King relayed the reason Charles Darwin remains one of his favorite philosophers, in defining who “the fittest” are in the processes of evolutionary change:

For all my life I thought survival of the fittest meant the biggest, the strongest, the longest teeth, big strong arms... you know, that's what we all thought of. And I was having a conversation four or five years ago with somebody about this, and my friend said, "No, no, that's not what he [Darwin] said, go and read 'Origin of the Species.' And if you go and find the page where he talks about the survival of the fittest, and defines 'the fittest,' do you know how he defines 'the fittest?' Organizations, individuals or organisms most adaptable to change, that is who survives.” And we are living in THE most accelerated period of change in human history. And if we are not adaptable to it in a hurry, well... you know what happened to the dodo? (Sprankle, 2005)

Although there are some in conservative political circles who WOULD like to see formal teacher education programs “go the way of the dodo,” the current and future educational needs of our children plead otherwise. Educators, whether they were born as digital immigrants or digital

natives, need sustained experiences learning to acquire and teach others the skills of digital literacy. The pedagogies required for our digitally defined knowledge landscape are not instinctive or reflexive. In order to survive, and more than that—for who wants to merely “survive,” when the opportunity to THRIVE in our dynamically changing digital world exists—the new teacher education must evolve, redefining itself in light of the digital definers of our modern age. Eric Hoffer shared a similar sentiment when he wrote, “In a time of drastic change it is the learners who inherit the future. The learned usually find themselves equipped to live in a world that no longer exists.” Our world is rapidly changing, and it is high time teacher educators adapt to insure their relevancy in the present and into the future.

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## Author Note

Wesley Fryer is an educator, author, digital storyteller, technology integration pioneer, husband and father. He serves as an international and national presenter and speaker, addressing a range of topics related to education, technology integration, distance learning, and twenty-first century literacy.

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