Chapter 2
Competencies, Challenges, and Changes: A US Perspective on Preparing Twenty-First Century Teachers and Leaders

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Abstract This chapter articulates the challenge that educators, school leaders, and teacher educators face today in preparing learners for their future, given the reality of students' and teachers' lives today. It then provides a US perspective on teacher and leader preparation, specifically related to the use of ICT and goals of preparing individuals for twenty-first century expectations. It explores the pressures, issues, regulations, challenges, and goals of preparing educators and leaders for the schools our students need. Through a review of the extant literature and current trends, readers will gain knowledge of best practices and recommendations for future steps.

Keywords Twenty-first century schools • ICT • Teacher preparation • School leadership

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J.M. Spector et al. (eds.), *Competencies in Teaching, Learning and Educational Leadership in the Digital Age*, DOI 10.1007/978-3-319-30295-9_2

1 Introduction

Around the world educators, policy makers, and others are seeking best practices to prepare educators and leaders to improve student outcomes, prepare learners for their futures, increase student engagement, and integrate learning technologies into their curriculum; a universal goal is to ensure that all learners reach their full potential. Questions have been raised regarding the value of child-centered pedagogy, appropriate curriculum, and role of technology in this preparation. And yet, after thirty-plus years of effort aimed at integrating technology into US schools, Fullan (2013) stated, "It is now time for technology to join the fray in a more purposeful way in order to transform learning for educators and learners in the 21st century" (p. 3). The discovery and sharing of this "purposeful" way will require many educators to work together, share lessons learned, and invest energy in promoting policies to bring about changes (Schrum & Levin, 2015).

The students in our classrooms today are the first to have grown up with digital tools at their fingertips; students interact with information, create knowledge, and communicate their results to a real audience. Today's students grew up in the digital age and have never known a world without the Internet, cell phones, video games, on-demand videos, and portable computing devices. They use digital devices daily, and most have never known a time when information was not available from Google (Hatch, 2014). The tools are always "on," accessible anywhere there is Internet access, and many are collaborative. These learners have an expectation that their education will include the same authentic, relevant, and interactive characteristics. And yet, despite the long-standing potential of technology as a catalyst for transformative change in education (David, 1991, 1994; Sheingold, 1991); this ambitious goal has yet to be widely realized. Relatedly, Fullan (2013) shared the results of a study that found satisfaction with school to be 95 % in Kindergartners but only 37 % in ninth graders; the question then must be asked if schools and our educational curricula are truly preparing learners for their futures. Additionally, in a world of globalization and rapid technological change, schools must enable and require that students develop twenty-first-century skills, such as critical thinking and problem solving, communication and collaboration, and creativity and innovation, in order to be well prepared to live and work in the twenty-first century. Being literate in the twenty-first century requires more than knowing how to read, write, and compute. The Partnership for 21st Century Learning (2015) suggests the need for infusing information literacy, critical media literacy, and information, communication, and technology (ICT) literacy into every subject taught in schools. All these new literacies are necessary to survive and thrive in the twenty-first century. Without these skills, and others—such as visual literacy, multimedia literacy, and cultural literacy—our students will not be able to adapt to changes coming their way.

An Organization for Economic Co-operation and Development (OECD) study concluded, "People who do not master these competences may suffer from a new

form of digital divide that may affect their capacity to fully participate in the knowledge economy and society" (2010, p. 2). OECD further stated, "A second digital divide separates those with the competences and skills to benefit from computer use to those who do not. These competences and skills are closely linked to students' economic, cultural and social capital" (p. 2). For these and many other reasons, it is important that all schools investigate ways to provide access to each and every learner; this goal can only be accomplished by preparing current and future educators, and school leaders, for this new reality. Unfortunately, as Senge, a prominent theorist on organizational change, reminds us, "The fundamental flaw in most innovators' strategies is that they focus on their innovations, on what they are trying to do—rather on understanding how the larger culture, structures, and norms will react to their efforts" (Senge et al., 1999, p. 26).

Educator preparation and professional development programs are struggling to assist individuals in gaining knowledge and skills in these areas and the exemplary programs and ideas are worth sharing as best practices. Fullan has written that

> The question for the field of education is how it can best participate in this rapid learning cycle while working in an otherwise less and less functional system. The general conclusion for me is that this will be a messy period in which the best stance is to become a reflective doer and learner. One way of cutting this is to think of working simultaneously on continuous improvement and on innovation. (2013, p. 26)

Recent research by Kozma (2008) made it clear that several nations are currently well out in front in terms of national ICT policies. According to Kozma, national policies tend to be established based on four major rationales: (1) support for economic growth, (2) promotion of social interaction and development, (3) advancement of education reform, and (4) support for education management. The work of these countries who have established policies can serve as a model to others working to establish such policies. For example, Singapore has a long tradition of linking education policy to the economic system and the country's latest ICT Master Plan provides a good example of this approach. Jordan is a second nation that has clearly linked its national ICT plan to establish a knowledge economy. Emphasizing the social impact of ICT is a rationale especially attractive to developing countries and work in Chile provides a good example of policies emphasizing access in rural schools. Australia and South Africa both provide good examples of countries where national ICT policy is focused upon issues advancing educational reform. Finally, several countries have included policies based on the use of ICTs for management issues such as assessment and student attendance data. More recently, efforts around requiring coding in secondary schools (e.g., in 2015 Arkansas passed a law requiring all high schools to offer classes in computer science beginning with the 2015–2016 school year), and the spread of the Makerspace and Fab Lab efforts in school and in more informal settings can be documented (Schrum & Levin, 2015). Locations across the USA and other countries are becoming "education innovation clusters" in which people in a city or region pool their knowledge, best practices, and assets to improve education through technology and research (see: http://www.digitalpromise.org/).

2 The Human Element: Professional Development for Teachers

Despite 35 years of claims that technology will transform US classrooms (cf., Papert, 1980; Sheingold, 1991; Skinner, 1984), and massive financial investments, with overall instructional technology spending topping $13 billion worldwide in 2013 (Nagel, 2014), widespread well-integrated use of instructional technologies remains unrealized—underutilized by teachers and students alike (Ertmer & Ottenbreit-Leftwich, 2010). Perhaps the most compelling rationale for this shortcoming is a marked lack of meaningful professional development to prepare teachers to effectively integrate the technologies that have been installed in their classrooms into their instructional practices (Niederhauser & Stoddart, 2001; Office of Technology Assessment (OTA), 1988; Office of Technology Assessment, 1995; Project Tomorrow, 2008). These interactions among teachers, learners, technology, and support systems clearly represent a complex problem (Cox et al., 2013). Even with ongoing calls for an increased focus on preparing teachers to effectively integrate the use of instructional technologies into their pedagogical practices, the primary focus has been on procuring hardware, software, and infrastructure. Two important series of reports chronicled the infusion of technology into US schools during the 1980s and 1990s. The first were produced from data collected using National Surveys of Instructional Use of School Computers and US contribution to the international Computers in Education survey. The second set of reports was developed by the Office of Technology Assessment.

The report from the initial National Technology Survey focused primarily on the number of microcomputers available in schools, major uses of school microcomputers (primarily programming and drill-and-practice), amount of time students spent using computers, and location of microcomputer in the school (lab versus classroom) for 1580 elementary and secondary public, private, and parochial schools during the 1982–1983 school year (Becker, 1985a). The second report (approximately 7700 respondents covering the 1985–1986 school year) continued in this vein, reporting on access to hardware, which teachers used the technologies, allocation of computer time (computer-assisted instruction, programming, word processing, etc.), number of students involved in computer use, and relative use broken out by gender and ability (Becker, 1985b).

Continuation of this work through the US contribution to the Computers in Education survey conducted by the International Association for the Evaluation of Educational Achievement (Becker, 1991), resulted in a report that focused on the number of computers in US schools and noted shifts in how teachers were using them (away from programming and drill-and-practice and toward more productivity-based uses like word processing). Despite the fact that findings from these studies indicated that "teachers rarely used computers as a regular means of providing students with instruction or practice in traditional school subjects" (Becker, 1991, p. 386), researchers did not seem to acknowledge the importance of in-service training efforts that might have supported teachers in more fully integrating technology

use in meaningful ways. Although these reports were central to large-scale research efforts on the emerging instructional technology movement in US schools, the focus was on easily measurable variables like the number of computers, printers, network connections, etc. in schools, the location of computers, and how the computers were being used. Essentially no attention was given to how we were preparing teachers to use the technology that had been installed in their classrooms in the National Survey of Instructional Use of School Computers or the Computers in Education Survey.

Written "less than a decade [after] the first computers appeared on the education scene" (Office of Technology Assessment, 1988, p. iii), *Power On*! *New Tools for Teaching and Learning*, the first OTA report (1988) indicated that for the 1986–1987 school year a sample elementary school had spent 13 % of the total "computer use" budget on staff development (mandatory and optional workshops to support the district-developed curriculum). For the 1987–1988 school year, staff development funding had dropped to just 6 %. This may have been due to the fact that "…many districts have very limited funds available for in-service training in general; many also have limited facilities, resources, and expertise to prepare teachers to use technology." (p. 19) Further, much of the training teachers received focused on learning *about* computers rather than learning how to teach *with* computers.

In the second Office of Technology report on instructional technology, a key finding was that "Most teachers have not had adequate training to prepare them to use technology effectively in teaching. Currently, most funds for technology are spent on hardware and software. . . On average, districts devoted no more than 15 % of technology budgets to teacher training." (1995, p. 21). After concluding that "A majority of teachers report feeling inadequately trained to use technology resources, particularly computer-based technologies," (p. 129) this report provided a clear call for increased training efforts to support teachers—describing several funding initiatives and models for providing effective professional development that went beyond "treating technology as a compartmentalized subject, or an end in itself (e.g., providing teachers with a computer 'class')" (p. 234) while acknowledging that the focus continued to be on teaching teachers *about* technology rather than helping them learn how to teach *with* technology. The nature of professional development in general, and the specific challenges associated with helping teachers integrate technology into their established practices came under scrutiny as educational policy makers began to recognize the importance of professional development as a key component in their educational technology investment.

However, Schrum (1999) has pointed out that teacher professional development for technology is particularly challenging—and that all forms are not equally effective. Her review of relevant literature suggests that professional development for technology takes considerably longer than professional development for other instructional and curricular innovations, requires access to equipment at home and at school for extended practice and to build comfort, is often more intimidating than professional development for other purposes, makes participants feel uncomfortable with technology and fearful of looking foolish, and often requires educators to reconceptualize the ways in which they have completed common tasks for many years. Further, training workshops are often held in computer labs that take teachers

away from the comfort of their classrooms, and technology training tends to be "just in case" learning rather than "just in time" learning—like teaching a group of teachers how to use a spreadsheet program just in case they ever want to use it.

Despite the form professional development might take, and the amount of professional development that teachers receive, formal professional development appears to have been less successful than simply allowing teachers to learn on their own. A 2000 *National Center for Educational Statistics* (NCES) report confirmed concerns raised about teacher professional development for teachers when they stated that only 33 % of surveyed teachers felt they were "well" or "very well" prepared to use technology with their students (Parsad, Lewis, & Farris, 2000); while a 2010 NCES report (that did not report on teacher preparedness) indicated that 2/3 of US public school teachers in the sample had received less than eight hours of in-service training for using technology with their students, and 78 % had indicated that a "moderate" or "major" extent of their training had been through "independent learning" (Gray, Thomas, & Lewis, 2010). Thus, our efforts to prepare teachers to successfully use technology with their students appear woefully inadequate.

Current one-to-one initiatives (whether laptops, tablets, smart-phones, or other) will likely compound this problem as teachers, who had previously been charged with taking their students down to the computer lab once a week, or bringing a laptop cart into the classroom for the occasional project, now have constant access, and accompanying heightened expectations, that provides opportunities for them to use technology with their students all day every day. Unfortunately, teacher professional development workshops in one-to-one initiatives (often given by the vendor who received the district contract for the devices) typically focus on providing teachers with the skills they need to use the technology themselves (Penuel, 2006), while teachers typically feel the need for training and support that will help them use technology effectively in their day-to-day teaching (Davies, 2004; Fairman, 2004; Niederhauser & Schmidt-Crawford, 2013). As Collis (1996) pointed out, the teacher ultimately shapes the success of any computers-in-education initiative. If we continue to focus on simply installing technology in classrooms, without preparing and supporting teachers to use it effectively with their students, it seems unlikely that we will ever realize the potential of technology to help us reach our transformational goals.

3 Student Learning, Assessments and Twenty-First Century Skills

One key factor in the proliferation and accompanying setbacks of technology in schools involves the goals for technology use and the assessment of student learning. Early on, computers in the classroom began with a combination of bottom-up excitement by innovative teachers and top-down adoption by administrators seeking to implement visible, innovative practices. For more than three decades now, schools have adopted the goal of ICT integration for a wide range of reasons. The most consistent rationale has been tied to a sense that technology is the "way of the future" and

schools need to prepare students for a technology-rich world. That general argument included the need for students to be skilled in the technical aspects of using ICT required in the work world as well as to be fluent in their ability to search for, gather, and critically evaluate information (Partnership for 21st Century Learning, 2015). These goals have been widely embraced and have permeated standards for learning across subject areas and grade levels.

In addition, there has been broad support for the use of technology to support a full range of curricular goals. And while virtually all have supported the *technology is the future* rationale, there was much less agreement on how to apply technology to address curricular goals. While some called for computers to be used as cognitive tools for students and teachers, others sought to develop computer-assisted instruction to assess and develop basic skills. Many argued that ICT has the greatest potential to enhance student learning when part of innovative, reform-minded teaching (Becker, 2000; Ertmer & Ottenbreit-Leftwich, 2010; Kozma, 2003; Sandholtz, Ringstaff, & Dwyer, 1997; Wenglinsky, 1998, 2005) while others sought to promote instructional systems that reduced or minimized the role of the teacher in the learning process. Suffice it to say that while schools were purchasing computers in unprecedented quantities, there was no clear consensus about the pedagogical approaches that would support their optimal use.

One effort to illuminate issues of pedagogy and technology were presented in *Plugging In*: *Choosing and Using Educational Technology* (Jones, Valdez, Nowakowski, & Rasmussen, 1995). Jones and his colleagues posited that the intersection of two continua—learning engagement and technology performance—could be useful in analyzing technology practices that support student learning and help educators ensure that their use of technology would complement student learning goals. In this framework, learning is represented on the horizontal axis and progresses from *passive* at the low end to *engaged* at the high end. On the vertical axis, technology performance is represented from *low* to *high*. Thus, the framework provided a second dimension to the low-tech to high-tech continuum that consumed both educators and the public alike. Among other things, the *Plugging In* framework was particularly useful for staff developers to help identify pedagogical issues and practices associated with various applications of technology.

Subsequently, a framework for technology integration, Technological, Pedagogical, and Content Knowledge (TPACK) (Koehler & Mishra, 2008; Mishra & Koehler, 2006) has gone viral in the field of technology and teacher education. Based on Shulman's (1986) idea of Pedagogical Content Knowledge (PCK), TPACK adds technology to the equation and focuses on the interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). A key contribution of the TPACK framework to the field has been its emphasis on pedagogy involved in effective technology integration. TPACK has provided a common lens and vocabulary that highlights pedagogy as a key variable in learning with technology. In fact, many have adopted TPACK as a rationale for promoting constructivist-oriented pedagogies to support optimal technology integration. It should be noted, however, that the TPACK framework is by definition pedagogically neutral, encompassing a full range of approaches across the component forms of knowledge.

3.1 One-to-One Computing

Issues of technology advocacy and accompanying pedagogical approaches have been illustrated by the proliferation on one-to-one projects. One early, high profile project was the Apple Classroom of Tomorrow (ACOT), which was conducted at multiple sites for a decade beginning in 1985. ACOT researchers sought to turn the clock ahead by providing two computers for each student—one for the classroom and one for home. Laptops, let alone mobile devices, were not viable options at that time. In studying the impact of ubiquitous computing, they found that technology-rich learning environments tended to evolve from traditional practices toward fundamentally different forms of interactions among students, involved higher level cognitive tasks, and led to constructivist-compatible beliefs and practices among participating teachers (Sandholtz et al., 1997). They observed "text-based curriculum delivered in a lecture-recitation seatwork mode is first strengthened through the use of technology and then gradually replaced by far more dynamic learning experiences for students" (Dwyer, Ringstaff, & Sandholtz, 1991, p. 47).

The ACOT program paved the way for a myriad of one-to-one projects that have since followed. In virtually all of these, the commitment to using innovative technologies far exceeded any clear agreement on how they should be implemented. In a comprehensive synthesis of research on one-to-one computing initiatives, Penuel (2006) found that while students consistently increased their technology literacy and skills, what is less clear is "what the potential is for one-to-one initiatives to improve student achievement in core subjects" (p. 341). He continued that few studies tested the links between identified outcomes and different implementation measures. In fact, he added, "a number of studies in the synthesis did not clearly specify the overall goals of the initiative they were studying" (p. 341).

Today, one-to-one programs proliferate using tablets, netbooks, and other mobile devices. While outcomes pertaining to student engagement and twenty-first century skills remain consistent, outcomes pertaining to student achievement in core content remain uneven. Many would argue that this discrepancy could be directly tied to No Child Left Behind (NCLB), the US educational policy initiative that shaped accountability measures in US schools and directly impacted the fate of technology-based reforms.

3.2 NCLB and Standardized Assessments

While it's beyond the scope of this chapter to detail the impact of NCLB, many would agree that it is at direct odds with technology-enhanced, student-centered learning. Educators have argued that standardized assessments in the USA have focused on discrete knowledge and skills at the expense of deep content knowledge, higher order thinking, and problem solving and that revisions in the testing process are needed (Darling-Hammond, 2010; Ravitch, 2010; Wagner, 2010).

As we've been pushed by federal policy to *leave no child behind*, we've ironically created another achievement gap—the gap between what is emphasized in standardized assessments and the skills most needed for the twenty-first century (Wagner, 2010). In many cases, progressive educators who have embraced the potential of technology to enhance teaching and learning have had to justify their approaches within the unrelenting press for student achievement. While many teachers have adopted mobile technologies and innovative applications that motivate their students, they do so without a clear sense that their efforts will lead to increased measures of student achievement. In his volume *Technology and Assessment*, Michael Russell confirmed, "…*standardized tests are often not well aligned with the learning that occurs with computers* (Russell, 2006; p. 185).

That said, it appears that with the adoption of new core standards for learning and the development of more thoughtful assessments, there is some hope on the horizon. The leading options for Common Core assessments are the tests developed by two consortia funded by federal grants: the Partnership for Assessment of Readiness for College and Careers and the SMARTER Balanced Assessment Consortium. These tests, first administered in spring 2015, are sure to be closely scrutinized as potential solutions to our assessment challenges. It is hoped that the new assessments are more in line with international standards that promote deeper learning and higher order thinking, which would then serve as a big boost for teachers who have not fully adopted technology due in part to strong emphasis on assessing discrete skills and covering required curricula. When teachers see that teaching with technology supports student learning and achievement as measured by current assessments, adoption by teachers may very well reach a tipping point. Resolving the tension, however, between the goals of innovative, twenty-first century teaching and learning and the press for assessment and accountability remains a core challenge for educational reformers. Without progress in this area, the potential of technology-based teaching and learning will clearly not be realized on a large scale in US schools.

3.3 Leaders' Roles and Responsibilities

Empirical evidence shows that no matter how much preparation for integrating technology teachers receive, unless they also have the leadership of their administrator, they may be unable to successfully use that technology most effectively. In fact, several studies have suggested that administrative support is the most important factor in technology implementation and that without it other variables will be negatively affected (Ertmer et al., 2002; Gerard, Bowyer, & Linn, 2008; Hilliard & Jackson, 2011).

Being an educational leader in the twenty-first century requires conquering some very challenging tasks. One of the challenges is meeting the needs of today's learners so they have the knowledge and skills to be college and career ready, and hiring and retaining the right people to make this happen. Increasing expectations,

implementing evolving standards, and meeting new policies are also part of the ever-changing challenges dotting the educational landscape today. Learning how to meet these challenges is especially difficult when the landscape continues to shift. Part of the challenge for school and district leaders includes learning how to leverage appropriate technologies for communication as well as instructional and administrative purposes most effectively. Another challenge for twenty-first century leaders is managing constant change, and learning that many changes must be addressed nearly simultaneously.

However, most US administration programs do not prepare school leaders to harness digital technologies to promote a twenty-first-century curriculum, and systems are not necessarily in place to support the changes required. Educators are faced with an ever-changing landscape that demands they remain knowledgeable, update their pedagogy to take advantage of new characteristics, and collaborate for improved student outcomes (Ainsa, 2013; Eyyam & Yaratan, 2014; Karchmer, 2001). Fullan and Langworthy (2014) suggest these "new pedagogies… require students not only to create new knowledge, but also to connect it to the world, using the power of digital tools to do things that value in our knowledge-based, technology-driven societies" (p. 1). New conceptions of formal and informal learning, especially in the maker movement (Martin, Bowden, & Merrill, 2014; Martinez & Stager, 2013; Peppler & Bender, 2013), require continuous professional development and revisions of teacher candidate preparation; school leaders must encourage and support these activities. Professional development now takes many forms from traditional workshops to online collaboration (Cifuentes, Maxwell, & Bulu, 2011; Ertmer et al., 2002; Hartsell, Herron, Fang, & Rathod, 2010). In addition, several studies have suggested that administrative support is an important factor in technology implementation and that without it other variables will be negatively affected (Ertmer et al., 2002; Gerard et al., 2008; Hilliard & Jackson, 2011). In the case of ICTs in education, most change efforts have overly emphasized affordances of hardware and software, supported by generic technology training, at the expense of actual implementation in the schools.

As Vanderlinde and van Braak (2013) noted, "Technology planning in schools is a complex and nuanced phenomenon" (p. 17), and it must involve all stakeholders "in the process of technology planning: the schools' technology coordinator, teachers as leaders, the school team, the school leader and the school community. These actors interact formally and informally and, therefore, influence the process of technology planning" (p. 16).

Levin and Schrum studied several award-winning leaders of schools and districts in California, Maryland, Michigan, Minnesota, North Carolina, Virginia, and Washington who successfully used technology as part of their efforts to improve their schools (Levin & Schrum, 2012; Schrum & Levin, 2012). Their research applied theoretical notions of distributed leadership to analyze school leaders, the context of the schools, and myriad groups and individuals within each school and district in an effort to understand ways exemplary leaders organized, implemented, and promoted student achievement, school improvement, technology implementation, and teacher involvement (Mayrowetz, 2008). Distributed leadership assumes "a

set of direction-setting and influence practices potentially enacted by people at all levels rather than a set of personal characteristics and attributes located in people at the top" (Leithwood, Jantzi, & McElheron-Hopkins, 2006, p. 20), which is what they found happening in all the award-winning, exemplary schools and districts studied.

Spillane, Halverson, and Diamond (2001) suggested that to understand leadership, it is important to look beyond what one person can do, or knows how to do, but look instead at what each person brings to the task, build on strengths, and collaboratively tackle issues. Their central premise is that school leadership is "understood as a distributed practice, stretched over the school's social and situational contexts" (p. 23). This lens proved to be exceptionally useful in examining ways teachers and other educators can and do contribute to the success of students and schools.

Levin and Schrum also located their work in a systems approach to change, and elucidating how change occurs in an educational organization made up of interacting, interrelated, and interdependent components (Levin & Schrum, 2012; Schrum & Levin, 2012). Their research supports the literature that suggests all components must work together when making changes, if they are to be sustained and embraced by all (Adamy & Heinecke, 2005; Kopcha, 2010; Senge et al., 2000). Further, their research showed that all parts of a system have to be addressed in concert, and adding one component (e.g., technology), or changing one part (such as the curriculum), is not enough to make a difference in the system. Thus, school leaders need to keep in mind vision, curriculum, professional development, resources, technological infrastructure, as well as communicating with the larger community.

Overbay, Mollette, and Vasu (2011) also suggest that school leaders keep several things in mind as they move through the process of a technology planning experience. First, they remind all of us that it is "not about the technology" (p. 56). They state, "The most important lesson we've learned is that technology initiatives are about people" (p. 57). Second, the plan must fit the school or district, not the "ideal" plan someone else may have adopted. Next, they remind us that professional development must be entwined throughout the entire plan. Fourth, they suggest "collaboration has a very real place in schools implementing a technology initiative" (p. 58). Effective school leaders were adept at reconfiguring time to allow educators to spend quality time talking and planning together (Schrum & Levin, 2012). They developed job-embedded Professional Growth Period in which teachers were given two or three periods during the week to follow their personal professional development plan. This is typically accomplished by removing some noninstructional duties from teachers' assignments. Finally, it was noted that leaders found ways to become turnover proof because if they have only focused on a few key individuals, the school may end up without teacher leaders if there is a rapid change in staff.

It seems clear that it is not enough to provide preservice and inservice educators with opportunities to learn with and use technology for teaching and learning; it is essential that the entire system of an educational enterprise be engaged, involved, and supported to truly prepare our learners for their future. Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur (2012) stated that to make a difference in learning, "…technology [must] be placed in the hands of students, who are encouraged and enabled to utilize it in the same ways, and for the same purposes, that

professionals do—that is, to communicate, collaborate, and solve problems" (p. 24). Furthermore, these authors found that increasing access was not enough "if this increased access was not accompanied by a corresponding shift in teachers' pedagogical beliefs" (Ertmer et al., 2012, p. 24). Also, it is important to remember that teachers' beliefs and knowledge can be impacted by other factors including "culture, socioeconomic status, and school organizational structures" (Harris & Hofer, 2011, p. 213). For example, if there is not strong support for technology integration by the administration or among the teachers in a school, those wanting to integrate technology may be negatively impacted. Ertmer and Ottenbreit-Leftwich (2010) suggested that encouraging small changes based on the teachers' comfort levels may lead to larger overall changes in the way they approach technology integration.

4 Conclusion

This chapter has highlighted the need for and challenge of preparing our learners for their future; this challenge must be met by preparing current and future teachers and leaders to consider all available resources, pedagogies, and authentic activities in reaching this goal. Institutions that prepare teachers and leaders are obliged to ensure their graduates have knowledge and experience in accomplishing this goal, and further, that professors have the professional development they require to maintain currency. It may no longer be acceptable for primary and secondary schools to be better equipped than colleges of education (Schrum & Levin, 2015).

What will it take for our educational system to move forward? Infrastructure is essential but not sufficient. Regardless of the improvement in the technological infrastructure, it is important to remember regarding the use of ICT that

> While the availability of computers and Internet connections at schools is clearly a prerequisite for ICT use, it is a necessary but not a sufficient condition. The availability of educational software and other digital learning resources and the ICT competences of teachers are equally important in ensuring broader and more efficient use of ICT in the teaching and learning processes in school and at home. (OECD, 2010, p. 171)

Policies and practices must support risk taking, innovation, creativity, and questioning by students as well as by teachers. Professional development must be continuous and relevant to reimagining the educational system as we know it. Student outcomes must be broadened beyond one high stakes test at the conclusion of a year; systematic assessment is necessary to promote learning rather than just rate learning. The global educational community has begun to work together to help identify common needs and challenges; more importantly, it is starting to share research and best practices. Together we can create strong research agenda to improve educational opportunities and outcomes for all our learners.

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http://www.springer.com/978-3-319-30293-5

Competencies in Teaching, Learning and Educational Leadership in the Digital Age
Papers from CELDA 2014
Spector, J.M.; Ifenthaler, D.; Sampson, D.G.; Isaias, P. (Eds.)
2016, XXII, 363 p. 42 illus., 27 illus. in color., Hardcover
ISBN: 978-3-319-30293-5