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The Changing Context of Teaching and Implications for Teacher Education

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ABSTRACT

Current efforts to improve teacher quality are misguided by a misunderstanding of the education we need in the future. The efforts are rooted in an education paradigm that worked in the Industrial Age but is becoming obsolete due to revolutionary changes brought about by technology. To prepare our children for their future, we need to redirect our efforts toward shifting the education paradigm, which requires a different kind of teaching force equipped with a different set of abilities from the traditional set of content knowledge and pedagogical skills. This article outlines the reasons for the need of a paradigm shift and outlines a paradigm of teaching. It further suggests some elements of new qualities teachers will need for effective teaching in the new paradigm.

The National Council on Teacher Quality (NCTQ), a think tank founded by the conservative Thomas B. Fordham Institute in 2000, has become the biggest disruptor in American teacher education. With its influential reviews and ratings of teacher preparation programs (Greenberg, McKee, & Walsh, 2013) (NCTQ, 2018) and state teacher preparation policies (NCTQ, 2017b), NCTQ has successfully engaged the nation's teacher education institutions in a futile and consuming war of no winner. On the one side, NCTQ regularly fires shots at the teacher education profession with evidence (e.g., Greenberg et al., 2013; Pomerance, Greenberg, & Walsh, 2016) to prove that teacher preparation has “become an industry of mediocrity” (Greenberg et al., 2013, p. 3). On the other side, teacher preparation profession fires back by challenging NCTQ's “shaky methods and shaky motives” (Fuller, 2014, p. 63) with evidence to expose NCTQ's flawed methods and reasoning (AACTE, 2018; Henry & Bastian, 2015; Ravitch, 2012).

This war has no winner. The teacher education profession is a loser with further damaged reputation and additional government regulations to comply with. But NCTQ is not a winner either, unless its purpose is to ruin the reputation of teacher preparation, which does not seem to be. “Teacher educators and their critics both want the same thing—a better education for tomorrow's teachers,” wrote NCTQ president Kate Wash in 2016 (Walsh, 2016). Ultimately, NCTQ wants “to restore the teaching profession to strong health so we can provide every child with the education needed to ensure a bright and successful future” (NCTQ, 2017a).

If “a better education for tomorrow's teachers” and providing “every child with the education needed to ensure a bright and successful future” are what it really wants, NCTQ lost the war before it was started because its efforts have nothing to do with “tomorrow” or “future.” The qualities of the ideal teacher NCTQ wanted were constructed from an education paradigm that has become increasingly outdated (Barber, Donnelly, & Rizvi, 2012; Sahlberg, 2013; Trilling & Fadel, 2009; Wagner, 2008, 2012; Wagner & Dintersmith, 2016; Zhao, 2014, 2018a). Thus even if it were successful, the teachers NCTQ wants to

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produce would not be adequate for delivering the education needed for ensuring a bright and successful future for our children.

To be fair, the teacher education enterprise has been working on equipping teachers with similar qualities NCTQ advocates, albeit not as narrow as NCTQ's definition. However, had there not been NCTQ and other similar efforts such as accountability measures prescribed by the No Child Left Behind Act ("No Child Left Behind Act of 2001," 2002), the teacher preparation industry might have had some room and incentive to reimagine what teaching in tomorrow's education could look like and what qualities would be needed for effective teaching in the future. The fights over who is responsible for the perceived low teacher quality and decline of education and how to improve teacher quality as traditionally defined (Auguste, Kihn, & Miller, 2010; Clotfelter, Ladd, & Vigdor, 2006; Darling-Hammond, 2000; Hanushek, 1971; Nye, Konstantopoulos, & Hedges, 2004; Rice, 2003; Wilson, Floden, & Ferrini-Mundy, 2001) have wasted the resources and opportunities for such reimagination. As a result, we are putting in more efforts to prepare teachers for the past, while the world needs teachers for the future.

Teachers of the past: Current definition of teacher quality

The view of teacher quality and teacher qualities NCTQ has been pushing is an extremely narrow version of the traditional education paradigm, which aims to instill in students a set of knowledge and skills deemed valuable by authorities (Zhao, 2012, 2016b). Thus a teacher's responsibility is to teach students the predetermined knowledge and skills, or in more general terms, to improve student academic achievement. But the version pursued by NCTQ and other reform efforts narrow academic achievement to scores in standardized tests (Ravitch, 2012). Consequently, teacher effectiveness or teacher quality is equated with raising test scores. That is, a high-quality teacher is one whose students' test scores improve the most. In contrast teachers with students who do not see significant increases in their test scores are considered ineffective or of low quality.

This extremely narrow view of teacher quality gained prominence and became the predominant perspective driving education policy in the last few decades. Much of the research evidence NCTQ used to support its perspective and approaches to teacher preparation is rooted in this view, that is, effective teachers have students who can improve their test scores (Barber & Mourshed, 2007; Jordan, Mendro, & Weerasinghe, 1997; Rowan, Correnti, & Miller, 2002; Sanders & Horn, 1998; Sanders & Rivers, 1996). For example, one of the most influential studies NCTQ uses to justify its insistence on making teacher education more selective is a study published in 2007 by the global consulting firm McKinsey and Company (Barber & Mourshed, 2007, p. 40).

The study popularized the meaningless slogan "The quality of an education system cannot exceed the quality of its teachers" (Barber & Mourshed, 2007, p. 40). Ostensibly this conclusion was drawn from both quantitative and qualitative evidence. The research team examined policies and practices in top-performing and fast-improving education systems according to the performance on the Programme for International Students Assessment, better known as PISA. But the outcome is simply test scores in math, reading, and science of 15-year-olds on one test.

Using PISA scores as the equivalent of quality of education and teachers, the McKinsey researchers found that high-performing and rapidly improving education systems seem to recruit top-scoring graduates into their teaching profession. "The top performing systems we studied recruit their teachers from the top third of each cohort graduate from their school systems: the top 5 percent in South Korea, the top 10 percent in Finland, and the top 30 percent in Singapore and Hong Kong" (Barber & Mourshed, 2007, p. 16). Thus they conclude and recommend that to improve education, education systems should make the teaching profession more attractive so they can make admissions to teacher preparation programs more selective (Auguste et al., 2010; Barber & Mourshed, 2007).

This is factually incorrect. Finland, for example, does not recruit teachers from the top-scoring students (Sahlberg, 2017). More important, even if it were factually correct, the reasoning is flawed. The observation that high PISA performers recruited more top-performing graduates into teaching is at best evidence of a correlational relationship between teachers' academic performance in secondary schools and PISA performance. But correlation is not causality. There is no empirical evidence that substantiates

that the high PISA performance of these systems was caused by recruiting only the top students into teaching. Empirical research in this field remains inconclusive, pointing to a diverse set of qualities that affect teacher effectiveness (e.g., see Clotfelter et al., 2006; Darling-Hammond, 2000; Hanushek, 1971; Nye et al., 2004; Rice, 2003; Wilson et al., 2001). In fact, research has shown that academically high-performing teachers could negatively affect some students (Grönqvist & Vlachos, 2016; Zhao, 2018b).

However, NCTQ, like many policymakers, apparently did not pay attention to the methodological and logical flaw of the study. They accepted the recommendation and made admission selectivity—incoming students' standardized test scores (SAT/ACT)—as a major standard in its Teacher Prep Reviews. Including selectivity as a standard has had impact on teacher preparation programs and states' policies. For example, in 2015, the number of states that set high admission standards reached 25 but the number dropped to 11 because the Council for Accreditation of Educator Preparation (CAEP) agreed to allow programs to delay verifying students' academic ability until graduation (NCTQ, 2016).

This narrow view of teacher quality led to a narrow view of teacher qualities. Although subject matter knowledge and pedagogy have been generally accepted as the two defining core elements that constitute the qualities of teachers (Calderhead, 1996; Darling-Hammond, 2012; National Board for Professional Teaching Standards (NBTS), 1989; Rice, 2003), NCTQ has a specific and narrow view of pedagogy. For example, it insists that six instructional practices are “proven practices that promote learning for all students, regardless of grade or subject, and that are especially potent with struggling students” (Pomerance et al., 2016, p. vi). As a result, NCTQ's review of textbooks used in teacher preparation programs criticized teacher preparation institutions for not adequately teaching these six strategies. NCTQ also believes in “data-driven instruction” in which teachers make instructional decisions based on evidence of student performance. But the evidence for NCTQ is far more than teacher professional judgment. It includes standardized test scores as well. Thus all teachers need knowledge of assessment so they “can comfortably understand and utilize—both individually and collaboratively—a full range of classroom and standardized data” (Greenberg & Walsh, 2012, p. 25). Again, NCTQ criticizes that teacher preparation programs in America do not sufficiently teach assessment knowledge to future teachers (Greenberg & Walsh, 2012).

The current dominant view of education, teacher quality, and effectiveness, and what teachers need to know to be effective, particularly in the narrow perspective exemplified by NCTQ, OECD/PISA, and McKinsey, can be summarized in the following statements:

1. Standardized test scores accurately and reliably measure the quality of education, thus test scores are the outcome of education.
2. Teachers are responsible for improving test scores of their students in their classrooms, thus teacher quality is reflected in students' improvement in test scores.
3. To improve students' test scores, teachers must have knowledge of the subject matter and how to teach the knowledge.
4. There are only certain practices and strategies that have been proven to be effective in improving test scores, thus all teachers should be taught these strategies and skills.

This view of teachers, if fully realized, results in a homogenous teaching force. Every teacher would be identical and mutually replaceable: they would all have similarly high test scores or academic performance in high school; they would all be equipped with similar content knowledge of the subject matter they teach; and they would all be equipped with the same pedagogical skills and strategies. This view is valid only if we accept the premise that the outcome of education is academic achievement and academic achievement alone, as reflected in test scores. An associated premise is that teachers are the only source of learning for students. As well is the premise that teachers work independently and individually with students. These premises were once true and formed the foundation of the “grammar of schooling” (Tyack & Tobin, 1994), but they are being made invalid.

The changing context of teaching

The context of teaching is changing. The responsibilities of teachers should change accordingly, and consequently their abilities should change as well. Thus continuing to push this view of teachers will be

unlikely to result in high-quality teachers in the new context of teaching, which is necessary for preparing students to live successfully in a changed society.

Changing outcomes of teaching

The premise that a teacher's primary responsibility is to transmit prescribed knowledge, or more narrowly to improve test scores, has been challenged on multiple fronts. First, academic outcomes, especially when equated with test scores or grades, are a poor indicator of future success in life (Levin, 2012; Zhao, 2016c). There is plenty of evidence that suggests test scores have limited predictive power of an individual's success in life or a nation's economic prosperity (Baker, 2007; Tienken, 2008; Zhao, 2012). Scores in SAT, ACT, IQ, and other standardized tests have only weak associations with success in college or life for individuals (Brunello & Schlotter, 2010; Levin, 2012; Zhao, 2016c). Performance on international assessments such as the Programme for International Student Assessment (PISA) have not historically predicted prosperity of nations (Baker, 2007; Tienken, 2008; Zhao, 2014, 2016c).

Second, there are many other worthwhile education outcomes that schools are responsible for cultivating in students (Brunello & Schlotter, 2010; Duckworth, Peterson, Matthews, & Kelly, 2007; Duckworth & Yeager, 2015; Labaree, 1997; Trilling & Fadel, 2009; Wagner, 2008, 2012; Zhao, 2015, 2016a). Such outcomes include the so-called 21st-century skills (Kay & Greenhill, 2013; Metiri Group, 2003; World Economic Forum, 2011), creativity and entrepreneurial mind-set (Wagner, 2012; Zhao, 2009, 2012), resilience and grit (Duckworth et al., 2007; Duckworth & Yeager, 2015), growth mind-set (Dweck, 2008), and other human attributes that have been called soft skills, noncognitive skills, or nonacademic skills (Brunello & Schlotter, 2010; Gardner, 2007; Levin, 2012; Zhao, 2016a). These other outcomes have become increasingly more important in the 21st century when technology threatens to replace human workers in many traditional industries (Brynjolfsson & McAfee, 2014; Pink, 2006; Schleicher, 2010; Schwab, 2015; Tegmark, 2017; World Economic Forum, 2016a).

Third, academic outcomes, measured by test scores, do not necessarily correlate strongly with the growth of the other, perhaps more important, outcomes. In fact, internationally, test scores show a significant negative correlation with confidence, well-being, engagement, and interest in the test subjects (Loveless, 2012; OECD, 2017; Zhao, 2017, 2018b). Furthermore, an excessive focus on short-term academic outcomes can have a negative impact on the development of long-term outcomes such as creativity, curiosity, entrepreneurial mind-set, and motivation by narrowing students' educational experiences, stifling individuality, and fostering learned helplessness (Bonawitza et al., 2011a; Buchsbauma, Gopnika, Griffithsa, & Shaftob, 2011; Green, 1982; Nichols & Berliner, 2007; Tienken & Zhao, 2013; Zhao, 2017, 2018b).

Consequently, there have been increasing calls for broadening education outcomes beyond academic achievement or test scores (Duckworth & Yeager, 2015; Schleicher, 2010; Wagner, 2012; World Economic Forum, 2016b; Zhao, 2015, 2016a, 2018a). If and when the outcomes of teaching are redefined to be the development of human attributes and skills instead of mastery of prescribed content, teacher quality should be redefined as well because the content knowledge and knowledge of transmitting content may become much less important. If the outcome measures change, it may invalidate the research findings that teacher content and pedagogical knowledge is strongly associated with student learning, which has been measured by mastery of content.

Expanded sources of learning

Another premise that supports the current definition of teacher quality is that teachers are the sole source of learning. This premise is no longer true today. Although teachers with strong content knowledge and pedagogical skills are important, they are no longer the sole source of learning or even the primary agent of teaching. Information and communication technologies have advanced so much that students now have ubiquitous access to experts and content beyond their immediate classrooms. Besides the generic information widely available on the Internet, a vast amount of content aligned with school curriculum

presented by expert instructors has become available for little or no cost. These content materials are easily accessible and they can often be more relevant, engaging, personalizable, and on-demand than what is typically provided by teachers in classrooms (Bergmann & Sams, 2012; Bonk, 2011; Khan, 2012; Mitra, 2012; Zhao, 2018a). Students also have access to content experts, tutors, and fellow learners through social media and other forms of rich media communication tools such as Google Hangout and Skype.

Moreover, research suggests that children are capable of self-organizing their learning without being directly and explicitly instructed by an adult (Elmore, 2011; Mitra, 2012). Children are born learners (Smilkstein, 2011). They are motivated and are able to learn on their own, given the opportunities and materials (Bransford, Brown, & Cocking, 2000; Gopnik, Meltzoff, & Kuhl, 1999; Meltzoff, 1999; Smilkstein, 2011). In fact, research suggests that children learn more effectively without being directly or explicitly instructed. They learn from their peers through collaborative learning (Dillenbourg, 1999; Hamada, 2014; Hmelo-Silver, 2013). They learn by doing through authentic project-based learning (Bailey, 2016; Dewey, 1938, 1998; Diffily & Sassman, 2002; Thomas, 2000). They construct knowledge, test hypotheses, and formulate new ideas through exploring and experimenting socially and individually (Bransford et al., 2000; Harel & Papert, 1991; Papert, 1993; Piaget, 1957).

If teachers are no longer the primary source of learning, does content and pedagogical knowledge remain the core qualification of teachers? If students learn more effectively through other approaches rather than direct instruction and have access to other experts and content, do teachers still need to know the content of the subject as previously conceived? The answers are probably no.

Alternative ways of organizing teaching

The third premise supporting the central role of content and pedagogical knowledge in teacher qualifications is the traditional way of organizing teaching. In this arrangement, an individual teacher is responsible for teaching a group of children. Teachers teach in isolation from each other in their own classrooms (Davis, 1986; Lortie, 1975; Pomson, 2005). This way of organizing teaching is the reason for holding teachers individually responsible for their students' achievement.

This premise has been questioned on two levels. First, while teaching alone in isolated classrooms remains the *modus operandi* of schooling, it has been found to be a problematic arrangement for both teachers and students (Davis, 1986; Heider, 2005; Lortie, 1975; Pomson, 2005). There are ways to make teaching less isolated. For example, collaborative teaching or team teaching has been found to be more effective, especially for inclusion classrooms with students of special needs (Bakken, Clark, Thompson, & Thompson, 1998; Chu, Tse, & Chow, 2011; Jang, 2006; Robinson & Schaible, 1995; Tajino & Tajino, 2000; Thousand, Nevin, & Villa, 2007; York-Barr, Ghere, & Sommerness, 2007).

Furthermore, in many education systems such as China, Japan, and Finland, teaching is viewed as the collective responsibility (Cerbin & Kopp, 2006; Isoda, Stephens, Ohara, & Miyakawa, 2007; Klassen, Usher, & Bong, 2010; Lee & Smith, 1996; Sahlberg, 2011, 2017; Welch, Brownell, & Sheridan, 1999). In these instances, teachers work as a group instead of individuals. Thus, student learning is not the result of one individual teacher but the sum of the entire community of teachers. It is the collective capacity and efficacy of teachers that make a difference in student learning (Goddard & Skrla, 2006; Goddard, Hoy, & Hoy, 2000; Hattie, 2012). Moreover when teachers work in teams and collaborate with others, even beyond their immediate colleagues, students benefits from the exposure to a broad range of teacher interests and expertise. Research has found that teachers' social capital positively affects student learning (Baker-Doyle, 2011; Leana & Pil, 2006; Moolenaar, 2012; Pil & Leana, 2009).

Second, putting a group of students based on biological age before one adult teacher is an outdated legacy of the Industrial Age. This one-size-fits-all model of teaching has been long criticized for not being able to meet the needs of all children. As such, many different arrangements have been proposed and practiced over the past century. The Dalton Plan (Dewey, 1922), the Montessori method (Lillard, 1996), the Summerhill School (Neil, 1960), the Sudbury Valley School (Greenberg, Sadofsky, & Lempka, 2005), the Reggio Emilia approach (Hewitt, 2001), and many other programs have experimented with different arrangements for teaching. In recent years, there has been increasing appeal for a more

personalized approach to learning, which requires schools to personalize education pathways for students (Department for Education and Skills [UK], 2004; Zhao, 2012, 2018a; Zhao & Tavangar, 2016).

If teachers were not teaching as individuals and solely responsible for instruction, would content and pedagogical knowledge of each individual teacher be the same? If they worked as members of a community, should we look for diverse and complementary qualities instead of homogenous sets of skills in all teachers? Furthermore, if students were not put in one group based on the same age and instead were treated as individual learners with unique needs, would we want teachers to have the same content and pedagogical knowledge?

Reframing teaching: Innovating for the future

The premises that support the presently dominant conceptualization of teaching and consequently the definition of teacher quality face serious challenges, some of which are new, while others have long existed. These premises have become increasingly invalid or need to be discarded in the face of massive societal changes and new understandings of the learner, learning, teachers, and teaching. Teacher education prepares tomorrow's teachers, who will teach tomorrow's children to have a successful life in tomorrow's tomorrow. Thus it is incumbent for teacher educators to engaged in innovating teacher education for the future, rather than focusing on the present and the past. The innovation starts with reframing teaching.

First, the need to redefine education outcomes has gradually but surely become widely accepted. Increasingly, government bodies, businesses, and educational institutions have begun to realize that the traditionally defined outcomes such as academic achievement are no longer sufficient for future generations to live successfully in a world being drastically altered by technology. Technology has already led to massive displacement of human workers and will continue to do so in the foreseeable future (Brynjolfsson & McAfee, 2014; Schwab, 2015). The loss of jobs in traditional manufacturing, construction, and accounting industries is only a precursor to more jobs to be performed by Artificial Intelligence and smart machines. It is likely that the self-driving automobile, for instance, will lead to the loss of millions of jobs in the transportation industry. As a result, some traditionally valued skills and knowledge, such as rote memorization and information gathering, have been rendered obsolete or are being challenged (Florida, 2012; Wagner, 2008, 2012; Zhao, 2009). In the meantime, technology has created exciting new opportunities for traditionally undervalued talents and skills such as creativity, social-emotional skills, and abilities to entertain (Florida, 2012; Pink, 2006; World Economic Forum, 2011). Thus, there is a rising call for cultivating individuals who are entrepreneurial-minded, creative, innovative, resilient, and socially and emotionally healthy (Aspen Youth Entrepreneurship Strategy Group, 2008; Duckworth et al., 2007; Duckworth & Yeager, 2015; Dweck, 2008; Rose, 2016; Wagner, 2012; World Economic Forum, 2009, 2012; Zhao, 2012, 2018a).

In order to deliver the new outcomes, teaching needs to be reframed. Instead of transmitting a prescribed set of content and skills to all students, teaching needs to be more about supporting the growth of individuals. Instead of focusing on fixing students' deficits as identified by curriculum standards or testing, teaching should be about identifying and enhancing individual strengths. Instead of instructing knowledge and skills in specific subjects, teaching should be more about developing social-emotional qualities, nurturing creativity, and fostering the entrepreneurial spirit (Zhao, 2018a).

Second, efforts to reframe teaching must take advantage of the new possibilities brought about by technological advances and new findings of learners and learning. We know children are capable learners and they learn best when engaged in relevant, authentic, and challenging experiences. We also know that children today have ready and easy access to a vast range of learning opportunities through technology beyond their teachers. Therefore, teachers no longer need to be the sole source of knowledge and the only organizer of learning.

These changes relieve teachers from repetitive and mechanical instructional duties so they can focus more on the human aspects of teaching (Zhao, Zhang, Lei, & Qiu, 2015). They do not need to instruct the same content to one group of students. They can have more flexibility with how classes are organized. Teachers also can focus more on the development of nonacademic qualities of students. More important,

teachers can work more with individual students. In other words, teachers no longer need to continue the traditional “stand and deliver” paradigm of teaching, making it possible to reimagine teaching in a way that can deliver the new educational outcomes as previously discussed.

Third, one of the most persistent and significant problems in education is the failure to meet the diverse needs of individual students. As a result of the complex and sometimes random interactions between nature and nurture (Lewontin, 2001; Ridley, 2003), children come to school with vast differences academically, cognitively, physically, socially, and emotionally (Zhao, 2018a). They have different strengths and challenges, each possessing a jagged profile of passions and interests, perspectives, attitudes, and experiences (Rose, 2016). As a result, they have very different education needs.

There have been some attempts to address individual differences through such efforts as class size reduction (Krueger, Hanushek, & Rice, 2002), differentiated instruction (Levy, 2008; Tomlinson & McTighe, 2006), and individualized education plans for students with special needs (Smith, 1990). But the diverse range of different needs for all students cannot be met for numerous reasons in the traditional organization of teaching in which one teacher is responsible for a group of students. First, one teacher cannot have all the expertise required to meet the needs of a group of diverse students, even when the group is relatively small. Second, it is impossible for one teacher to accommodate the diverse learning styles of all students in a class. Third, one set of lectures, classroom tasks, homework, and assessment cannot be appropriate for all students. This is why even the effects of class sizes on student learning in the traditional sense remain debatable (Krueger et al., 2002; Woessmann & West, 2002). To truly meet the needs of all students requires personalizable teaching (Zhao, 2018a).

In light of the changed context of society and education, we can imagine a different paradigm of education (Zhao, 2012, 2018a). In this paradigm, education is not the imposition of a uniform set of skills and knowledge on all individual students or to fix perceived deficits (Zhao, 2016b). Instead, the purpose of education is to develop individual talents. Education should be personalizable, enabling students to construct a highly personalized experience. Students learn through engagement in creating authentic products to address worthwhile problems and create value to others. Students explore and pursue their interests in a well-resourced ecosystem of learning opportunities with the support of teachers.

In this paradigm, teaching does not start with prescribed content and skills, but with the children’s passion and talent. Teaching is not to instruct, but to create opportunities for individual students. Teachers’ primary responsibility is not to transmit knowledge but to help individual students pursue their interest and enhance their abilities. Teachers also help students identify and access resources from within and outside the school.

In this paradigm, teachers are “life coaches” who help students identify and achieve individual learning goals. They inspire students to have high aspirations, to explore possibilities, to try out their ambitions, and to explore strengths and weaknesses. They create opportunities and possibilities for each individual student’s passion and talents. They are deeply concerned about students’ physical, social, emotional, and psychological well-being. They challenge and encourage students to continuously aspire to be and do better. They help students understand and develop the ability to handle success and failure.

In this paradigm, teachers are curators of opportunities and resources for learning. They critically examine, thoughtfully select, and carefully construct a “museum” of learning opportunities to expose students to different possibilities and resources. These opportunities and resources are curated in response to each student’s needs. They guide students through these opportunities and help them develop personalized learning pathways and provide necessary support to help students make use of these opportunities.

In this paradigm, teachers work collaboratively in a community. They work with their colleagues, within and outside their school, to provide the expertise and resources that match students’ diverse needs. Thus teachers in a school have different talents, expertise, and passions that complement one another. They are not mutually replaceable, mechanical instructional machines, but unique human educators with different profiles of expertise, experiences, and talents.

In this paradigm, teachers are community organizers and project leaders. Individualized learning does not mean students always learn alone. Instead, very often students learn through authentic projects that involve other students. Meaningful and significant projects necessarily require the participation and contribution of many individuals with different and complementary talents and interests, which requires

students to work together in communities. Teachers are responsible for organizing these communities, facilitating the development of rules that make these communities operate effectively, and ensuring that these communities are beneficial to all members.

In the new paradigm, teachers are project leaders and managers. Students are working authentic projects all the time. Thus, teachers need to work with students to identify problems worth solving, facilitate project teams, and manage the progress with students. They need to help manage student teams, mediate conflicts, lead a process of quality control and constant feedback, and constantly motivate students.

Although the proposed paradigm of teaching is a drastic departure from the dominant paradigm of teaching today, the underlying ideas are not new and some of them have been practiced in varying forms in non-mainstream education. The idea of child-centered education has been articulated by philosophers and educators such as Rousseau (Rousseau, 2011) and Dewey (Dewey, 1938, 1975). It has also been put into practice in democratic education (Greenberg et al., 2005; Neil, 1960) and other programs such as Montessori (Lillard, 1996; Lillard & Lillard, 1997). The idea that students learn through engagement with authentic problems has fueled the movements of project-based learning, inquiry-based learning, and challenge-based learning (Kolomos, Fink, & Krogh, 2004; Strobel & Barneveld, 2009; The Buck Institute for Education, 2012; Zhao, 2012). There is also emerging evidence that schools and teachers who adopt this new paradigm of teaching, even partially and on a very small scale, have a significant and positive effect in helping students become more confident, entrepreneurial, innovative, and passionate individuals (Wagner & Dintersmith, 2016; Zhao, 2018a).

Redefining teacher quality

When teaching is framed differently, the role and responsibilities of teachers change accordingly. Consequently, the qualities needed for teachers in this new role change as well. As the role of the teacher shifts from being the primary source of knowledge and instruction to one that mentors, coaches, and supports individual growth of students in a community, a new set of qualities become more important than the old set of subject matter knowledge and pedagogy.

Broad and Long-Term perspective of teaching

In the new paradigm, teaching is more about the development of human qualities than the immediate delivery of knowledge. Teachers need to hold a broad perspective of education, focusing more on long-term educational outcomes than short-term instructional outcomes. They do not use one set of criteria for success or value to judge their students. Instead, they understand that education is much more than the transmission of knowledge. They focus more on educating the whole child than teaching the content. They understand that pursuing short-term instructional outcome can have a negative side effect on achieving long-term education outcome (Zhao, 2016a, 2018b). For instance, a longitudinal study found that early reading and early entry to school was negatively associated with well-being in later life (Kern & Friedman, 2009). Other studies show that efforts to boost short-term instructional outcomes can be “unproductive success” because the success impedes long-term outcomes such as deep conceptual change, curiosity, and creativity (Bonawitza et al., 2011b; Kapur, 2016; Zhao, 2017).

Ability to identify strengths and passion

One of the core assumptions underlying the new paradigm of teaching is that every student has a unique set of strengths and weaknesses, a jagged profile of abilities and interests (Rose, 2016). Teaching is to help every child discover and develop their strengths instead of fixing their weaknesses (Zhao, 2016b, 2018a). Thus, teachers should have the ability to look beyond the weaknesses and find strengths in students.

Empathy and social-emotional competency

In the new paradigm, students are considered unique individual human beings with a diversity of experiences and backgrounds rather than homogenous recipients of instruction. To reach each student and help him or her grow, teachers need empathy, which requires emotional intelligence. Teachers should be able identify with students and understand their passions, motivations, concerns, hopes, and expectations from the student's perspective. Research shows that teacher's social-emotional competence has a significant impact on student well-being (Jennings & Greenberg, 2009).

Resourcefulness and collaborative skills

The new paradigm may not require as much knowledge in content and pedagogy in the traditional sense, but it requires teachers to be more resourceful than before. They need to become knowledgeable of opportunities, tools, and other resources that can be made available to students. They need to be able to identify, scrutinize, and organize these resources. Teachers also need to be able to help students develop the ability to create their own learning ecosystem. Furthermore, when teaching as a community, teachers need to have strong collaborative skills to work with other teachers and experts outside the school.

Management and leadership skills

In the new paradigm, teachers need to move beyond traditional classroom management. Instead of maintaining discipline in the classroom, teachers need to manage student projects, individual learning plans, and pathways for each student. They also need to create and manage project-based learning communities. Thus, teachers need an extensive set of management and leadership skills that includes planning, communication, delegation, evaluation, and motivation, to name just a few.

Conclusion

In conclusion, current efforts to improve teacher quality are misguided by a misunderstanding of the education we need in the future. The efforts are rooted in an education paradigm that worked in the Industrial Age but is becoming obsolete due to revolutionary changes brought about by technology (Brynjolfsson & McAfee, 2012; Goldin & Katz, 2008). To prepare our children for their future, we need to redirect our efforts toward shifting the education paradigm, which requires a different kind of teaching force equipped with a different set of abilities from the traditional set of content knowledge and pedagogical skills.

This article outlines the reasons for the need of a paradigm shift and outlines a paradigm of teaching. It further suggests some elements of new qualities teachers will need for effective teaching in the new paradigm. Due to space limitations, this article does not address how these new qualities can be cultivated and what kind of teacher education is effective in equipping future teachers with these qualities.

The purpose of this article is to call attention to the future, to the changing context of teaching, and to necessary actions needed to delivering a better education for the future. To deliver a better education for the future requires policymakers to abandon the outdated view of education, teacher quality, and teacher education. It also requires teacher educators to work on preparing teachers for the future. As well, it requires different lines of research in teacher education. So far, much of the existing research on teachers and teacher education is based on teachers' ability to instruct preset content. However, when different educational outcomes become more important, we need to look for different sets of skills and qualities in teachers. For example, if we examined the growth of students' creativity, we might find that many of the conclusions about teacher quality in the existing literature become invalid.

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