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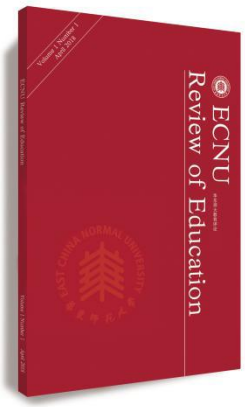

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Abstract

Purpose—The purpose of this article is to examine the consequences of mutual borrowing of educational policies and practices between the East and the West and implications for Chinese education.

Design/Approach/Methods—This paper draws upon a wide variety of historical, cultural, and international assessment data.

Findings—The analyses found that the mutual borrowing is unlikely to improve education to the extent that the future world demands.

Originality/Value—Thus, the article concludes that instead of wasting resources and time on learning from each other's past, education systems around the world should work on inventing a new paradigm of education. China is in a unique position to work on the new paradigm.

Keywords

Education reform; technology; comparative education; East Asian education; Western education; future of education

Britain's recent efforts to import Chinese education made the headlines across the globe. Major global media outlets such as the *New York Times* (Qin, 2017), *the Guardian* (Haas & Weale, 2017), and the *BBC* (Satchell, 2014) covered British government's actions to improve education by bringing in Chinese math teachers and math textbooks. There are many reasons why Britain's attempts to learn from China were deemed newsworthy, but one of them was perhaps the sudden reverse of perceived relationships between China and Britain. After all, China has been perceived as a student of the West for at least a century and half, ever since Britain defeated the great empire in multiple wars in the 1800s and forced it to replace its traditional education system with Western-style modern schooling (Zhao, 2014). Thus, the idea that China has become the teacher and Britain the student is surprising, shocking, and newsworthy.

Britain is not the only newly emerged admirer of education in China. The United States and a host of other Western countries have been attracted to education in China over the past few decades (Jensen, 2012; Stevenson & Stigler, 1994; Tucker, 2011a, 2011b, 2014, 2016). The Organization of Economic Co-operation and Development (OECD) has recommended that China is (or to be used as) a model of educational excellence for the world (OECD, 2011).

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China's ascendance to global education stardom is a result of the Program for International Student Assessment (PISA), the world's largest triennial test in math, reading, and science administered to 15-year olds in more than 70 education systems around the globe. In 2009, China, represented by students from Shanghai, shocked the world with its top performance on the PISA. Three years later, Chinese students aced the PISA again. The stunning performances turned China into the teacher of education lessons for not only Britain but also other education systems such as the United States and Australia, whose PISA performances have been at best mediocre in comparison (Jensen, 2012; OECD, 2011; Tucker, 2011a, 2011b, 2014, 2016; Zhao, 2014).

Understandably China is and should be proud of its newly acquired status as an exporter of educational ideas, but it is also keenly aware of the inadequacies in its own education. While it is happy to export ideas, China continues to look to the West for ideas to improve its education. It has been continuously engaged in massive education reforms to make teaching more Western (Zhao, 2014, 2015b). Chinese parents continue to be infatuated with Western style education. This explains the seeming irony that while the U.K. is importing Chinese education, many British schools, both private and state schools, have been opening branch campuses in China, making enormous profits from Chinese students eager to experience a British education (Hurst, 2016; Sharma, 2016; West-Knights, 2017).

Lessons that Cannot Be Learned

The ostensibly absurd, almost comic, mutual "love affair" between America/Britain and China, and to a larger extent between Western education systems and those in East Asia, is actually driven by rational reasoning. Each of them sees the other holding the secrets for improving education of their own. On the one hand, the Western education systems that have suffered from low performance in international assessments believe China and other East Asian education systems have found the way to make sure their students learn much more effectively than their Western counterparts (Barber, Donnelly, & Rizvi, 2012; Barber & Mourshed, 2007; Jensen, 2012; OECD, 2011; Stevenson & Stigler, 1994; Tucker, 2011a, 2011b, 2014, 2016). On the other hand, China and other East Asian education systems believe that Western education systems have the secret potion for growing creative, innovative, confident, and entrepreneurial individuals (Gao, 2003; Gao, 2015; West-Knights, 2017; Zhao, 2014).

The observations are backed up with evidence. If quality of education is defined as academic performances measured with international assessments such as PISA and the Trends in International Mathematics and Science Study (TIMSS), another triennial test in math and science of 4th and 8th graders in over 40 education systems, China and other East Asian education systems indeed have achieved excellence. They are

thus worth learning from. Other systems that the West has identified as teachers include Japan, Korea, Taiwan China, Hong Kong China, and Singapore, which have performed well in both TIMSS and PISA. It's worth noting that Hong Kong China and Singapore were former British colonies, while Japan, Korea, and Taiwan China have been significantly influenced by the United States both before and after World War II.

China's admiration of the capacity for innovation in the West is also well founded. Great Britain gave birth to the Industrial Revolution. The U.S. has produced the most patents, Nobel Prize winners, and most influential technological breakthroughs in modern times. As a whole, West Europe, Australia, Canada, and the United States have so far been the most prosperous economies driven by technological advancement. Most of the inventions that transformed human societies in modern times have been made in Western countries.

Inventions and discoveries are made by people who are creative. Creative genes should be equally distributed in all societies. Why have Western countries had more creative individuals than the populous China? The reasoning points to education (Lin, 2006; Zhao, 2014; Zheng, 2013). Somehow, Western education systems are more effective in cultivating innovative and creative talents.

Despite the logic and evidence underlying the efforts to learn from each other, both China and Western education systems are likely to be disappointed. The lessons they try to learn from each other are very unlikely to lead the results they expect because these lessons cannot be learned through simple emulation or systems replacements. The results both sides want are not directly derived from the education system, but rather from the interactions between education and culture of the respective systems. In essence, the education paradigm in operation in both China and the Western education systems is exactly the same paradigm, but realized differently due to cultural differences.

Same Paradigm of Education

The predominant education paradigm in the world, of course including China, Britain, the U.S., Singapore, and other places, is fundamentally the same. It starts with a predetermined curriculum that prescribes the knowledge and skills students should have at certain ages (grades). Students are put into groups based on their age. An adult teacher is in charge of teaching the group of students the prescribed knowledge and skills. The goal is to have all students master the prescribed knowledge and skills in a similar pace so that they can all have the required knowledge and skill at the end of their school experiences. Students are required to demonstrate their mastery, through one to two large standardized tests, an accumulation of testing results, or both at some point in their education career. Their levels of mastery are used as indication of their relative merit, which is used to allocate opportunities such as advancement in education or employment in a resulting and continuing meritocracy (Young, 1959, 2001; Zhao, 2012, 2016a, 2018a).

Variations in Realization

Just like organisms with the same genetic code adapt to different ecosystems and result in variations of characteristics, the same education paradigm adapts to different cultures and results in variations. All aspects of the paradigm can vary. For example, a culture can determine what is included in the prescribed curricula: some may include a broad range of subjects and others less broad. Cultures can also have different arrangements for the relative importance of subjects. For example, some cultures accord math and literacy much more importance than other subjects such as arts and music while others may treat them equally. Different cultures may have different views of the sequence of knowledge and skills children should have within a curriculum and within each subject. For instance, some societies may teach Physics before Biology and others Biology before Physics.

Moreover, who gets to determine curriculum varies a great deal. In some societies such as China and most East Asian systems, the curriculum is determined centrally by one body of authority and then applied to the entire nation, while in some other societies such as the United States, the authority to determine curriculum is reserved for each state.

Likewise, different societies may have different arrangements of teaching, for example, some societies have large class sizes with the teachers teaching few hours while other societies have smaller class sizes with teachers teaching more hours. The manner in which students demonstrate mastery also varies. In some societies, mastery is only demonstrated through one standardized tests at the end of the schooling experience, while in some other cultures mastery can be demonstrated cumulatively through performance in each course.

Additionally, but perhaps more importantly, culture plays a role outside the formal arrangement of schooling. It affects the behaviors of students, teachers, school leaders, and parents, resulting in implicit curricula or hidden curricula (Gatto, 2002; Wren, 1999) and shadow education (Baker, Akiba, LeTendre, & Wiseman, 2001; Bray, 1999). While both hidden curricula and shadow education have been typically used with a derogatory connotation that exacerbates inequality, they are used here simply to mean education experiences of students that are not explicitly prescribed in the formal curriculum. In this regard, students in different cultures have vastly different experiences beyond the formal curriculum and instruction.

The different realizations of the same paradigm in different cultures are the sources of variation in the perceived outcomes. Consequently, any attempt to borrow the educational policies, strategies, or practices is doomed to fail unless it also borrows the culture. But cultural transplantation is an extremely difficult task and very often undesirable and unwanted.

Chinese Performance as a Cultural Effect

Despite the claims of the OECD and some outside observers that the result of PISA

reflects the effects of universally portable lessons in education policies and practices (Jensen, 2012; OECD, 2011; Tucker, 2011a, 2014), more evidence points to culture as the factor that contributed to Chinese students as top performers (Cheng, 2011; Meyer & Schiller, 2013; Zhao, 2014, 2016e).

A study of PISA performance of Chinese immigrant students in New Zealand and Australia found that the Chinese immigrant students' performance is more similar to their peers in Shanghai than in their local schools (Feniger & Lefstein, 2014). There is no evidence that Chinese are genetically more likely to score higher on the PISA. So what the Chinese immigrants carry with them is the Chinese culture. Since they attend the same schools as their Australian and New Zealand peers, the Chinese immigrant students should have performed more like their schoolmates if schools made significant difference. It is apparent that "cultural background appears to be more consequential for the educational attainment of Chinese immigrant students than exposure to the educational systems of Australia or New Zealand" (Feniger & Lefstein, 2014, p. 845). Likewise, importing teachers and textbooks is unlikely to change the culture in British schools.

The policies and practices that have been identified as aspects of the education system that led to China's excellent performance are the products of the Chinese culture and society instead of an inherent quality of the education paradigm. For example, valuing education and the belief in effort rather than innate ability have been two of the most commonly suggested factors contributing to Chinese students' success (Chen, Lee, & Stevenson, 1996; Cheng, 2011; Coughlan, 2012; OECD, 2011). "There is a high value placed on education and a belief that effort rather than innate ability is the key to success", wrote Mark Boylan, a U.K. professor of education, "East Asian researchers usually point to this as the most important factor for this region's high test results" (Boylan, 2016).

But both valuing education and the belief in efforts are not inherent features of the education paradigm. Instead they are the traits of the Confucian culture, reinforced by over-a-thousand-year-old tradition of Imperial Exams or *keju*. "For centuries, Chinese people have believed in the value of education for the nation's well-being as well as for their own personal advancement" (Chen, Lee, & Stevenson, 1996, p. 83). The PISA team reached a similar conclusion: "China has a long tradition of valuing education highly" (OECD, 2011, p. 86). The *New York Times* columnist Nicholas Kristof noted that "the greatest strength of the Chinese system is the Confucian reverence for education that is steeped into the culture" (Kristof, 2011). It is clear these two most important factors cannot be easily imported to Britain, America, or any other Western countries.

More important, the long tradition of valuing education in China is a misnomer because it is not actually a long tradition of valuing education. Rather it is a tradition of pursuing the extrinsic reward of passing exams through studying. For thousands of years, China has successfully instilled in its people the idea that the only path for upward social mobility is through passing exams. Hence the entire society is devoted to helping children pass exams and compete through exams. Along the way, the

Chinese people have also been convinced that everyone has an equal opportunity to pass the exams as long as they work hard. The result is then a sharp focus on academic subjects included in high-stakes tests, the College Entrance Exams or *Gaokao*, the modern reincarnation of the *Keju* in China (Cheng, 2011; Zhao, 2014). This culture tradition results in the observed policies and practices the West wants to borrow from China: hardworking students devoted only to studying, devoted parents who sacrifice anything for their children's study, schools and teachers focusing exclusively on academic studies, and efforts to ensure teachers to be masters of the content they teach (Zhao, 2018b).

Another feature that the West wishes to borrow from Chinese education is its system of centralized and standardized curriculum and high-stakes testing. The system has been credited for high performance in China and thus recommended for adoption in other education systems (Tucker, 2011a). But the system is the result of long tradition of centralized governance in China and the absolute authority placed in the central government, another trait of the Chinese culture and found in many East Asian education systems. This culture trait is not necessarily shared in the West.

Creativity in America as an Accident

Just like the West cannot borrow lessons from China to improve its academic achievement, China cannot borrow lessons from the West, in particular the United States with its stunning achievement in science and technology since World War II, to cultivate more creative individuals because the American education paradigm is exactly the same as that in operation in China. The perceived capacity for cultivating creative individuals is the outcome of culture, indirectly realized through schooling. In other words, the fact that the U.S. happens to have more creative individuals so far is not an intended consequence of their education systems, but rather an accidental outcome of its culture.

There is no doubt that American education follows the same paradigm as that China follows: equipping children with the same set of predetermined knowledge and skills. However, the implementation is drastically different from that in China due to the cultural differences between the two countries for cultural and political reasons. First, the school system in the U.S. is extremely decentralized as a result of its decentralized government system (Tocqueville, 2003). At one time, America had over 100,000 school districts, in essence more than 100,000 governments, in the U.S. education system. Thus, America at one time could have had over 100,000 different curricula and definitions of educational outcomes. Even today, after many efforts to centralize the education authorities, the 50 states in the U.S. retain constitutional control of education within the state. Hence, at the least, the U.S. has about 50 different state curricula and determinations of educational outcomes, while China has one. The decentralized local control and political culture in education have made it almost impossible for America to have one curriculum for all children. For example,

the Common Core State Initiative (Common Core State Standards Initiative, 2011) attempted to push for a national core curriculum only in math and literacy, but met with great resistance from some states (Shimshock, 2017; Ujifusa, 2014).

Second, Americans do not treat academic achievement, particularly test scores, as the only outcome of education. Thus parents, teachers, the general public, and students have more diverse views of what education success means. This is partly due to original Puritanical emphasis of equality and individualism (Hofstede, 1984, 2001; Tocqueville, 2003), partly due to more diverse opportunities, partly due to the influence of the tradition of child-centered education philosophy (Dewey, 1938; Rousseau, 2011), and partly due to the influence of an immigration culture. Additionally, there is no tradition of one central government controlling and allocating all social and economic resources. Moreover, American higher education institutions enjoy tremendous autonomy and thus have more than one way to select students.

Consequently, parents, teachers, students, and schools do not have a uniform and exclusive focus on academic achievement in a narrow set of subjects. Test scores in a few subjects are of much lower stakes in the U.S. than in China. American parents, teachers, and students are not nearly uniformly obsessed with test scores as parents, students, and teachers in China. Schools offer a much broader set of activities than in China. Teachers pay less attention to mastery of prescribed knowledge and skills. Not all students are equally interested in being the best test takers, and they do not want to spend all their time on schoolwork. There is no uniform pressure on parents to ensure that their students do well in schools.

As can be expected, the American version of the education paradigm is awfully ineffective to ensure that all students in America master the same set of knowledge and skills, which explains why American students have never performed well on international assessments (Zhao, 2016b). But it is this ineffective system that accidentally produced the creative individuals in America. It is accidental because the operating paradigm of education in America, being the same as that in China, does not have as its goal to prepare creative individuals. It is poor implementation, due to the American culture, that accidentally gives opportunities for creative individuals to survive (Zhao, 2009a, 2012).

To be creative is to be different. Thus, creative people often have ideas, behaviors, beliefs, and life styles that deviate from the norm and tradition. They may also be interested in different domains than what is offered in schools. Research on the social and contextual influences of creativity has found that in general, tolerance of deviation from tradition and the norm resulted in more creativity (Florida, 2002, 2012). Schools have been generally found to suppress creativity because they demand conformity and obedience (Beghetto, 2013; Gajda, Beghetto, & Karwowski, 2017). "Most young children are naturally curious and highly imaginative ... after children have attended school for a while, they become more cautious and less innovative ... Unfortunately, it is necessary to conclude from the investigations of many scholars, that our schools are the major culprits. Teachers, peers, and the

educational system as a whole all diminish children's urge to express their creative possibilities" (Dacey & Lennon, 1998, p. 69). Researchers have also found a significantly negative relationship between high school class rank and students' confidence to generate creative ideas (Pretz & Kaufman, 2015). In a related line of work, researchers found that extra-curricular activities tended to be a stronger predictor of creative expression in college applicants than traditional admissions factors, such as SAT scores and high school rank (Cotter, Pretz, & Kaufman, 2016).

It is thus not hard to understand why America has more creative individuals than China. First, American children are exposed less to the creativity killing machine—the school because "American children spend less time in academic activities than Chinese and Japanese children do in terms of hours spent at school each day and days spent in school each year" (Stevenson & Stigler, 1992, pp. 52–53). American children also spend vastly less time on school work at home than their Chinese peers because most American children do not view schooling as central to their lives, while most Chinese children do (Stevenson & Stigler, 1992).

Second, conformity is emphasized much less in American classrooms than in Chinese schools because teachers have more diverse views of success and are more tolerant of differences. Unlike Chinese teachers who are keen to ensure all students progress at a similar rate and thus "make an explicit effort during the early months of elementary school to teach children techniques and skills that will allow them to function effectively in a group" (Stevenson & Stigler, 1992, p. 62). Inflexible rules and standard routines are just the right tool to squelch creativity (Beghetto, 2013; Dacey & Packer, 1992; Gajda et al., 2017; Stevenson & Stigler, 1994).

Third, American parents' broader conception of student success and less emphasis on external indicators allow students to "feel good" even if they excel in areas other than academic subjects. It also enables, if not encourages, children to pursue their interests and thus preserve some level of intrinsic motivation, which is essential for creativity (Beghetto, 2013; Beghetto & Kaufman, 2010; Dacey & Lennon, 1998; Zhao, 2018a). On the contrary, Chinese parents and the education system's emphasis on external indicators and high expectations naturally lead to less self-confidence and externalization of motivation, which is detrimental to creativity (Leung, 2002; OECD, 2017; Zhao, 2012, 2014).

Lastly, America's lack of a uniform centralized and standardized curriculum provides more opportunities for students to explore their interests. Although the paradigm is the same, what is prescribed and emphasized in each school district, each school, and even each state can be different. Thus, American students have a more diverse education experience, while the Chinese standardized and centralized curriculum, serves to squeeze opportunities for individual differences. Teaching at the same pace, following the same sequence, and using the same textbooks for all students leave little room for exploring individual interests and accommodating different learning styles.

In summary, education in China and the U.S. and to a larger extent East Asian education systems and Western education systems, all operate under the same

paradigm to instill in students prescribed knowledge and skills. But due to cultural differences, the implementation varies. The Confucian culture and the traditional centralized control of the society makes the Chinese implementation very effective in focusing the attention of education on a set of narrow outcomes. As a result, the Chinese implementation is extremely effective and efficient in ensuring that students master the prescribed knowledge and skills and demonstrating their mastery in standardized testing. In the United States, the cultural diversity, local control, and broader definition of success make the implementation less effective in ensuring all students master the same knowledge and skills. But this less effective implementation also allows individuals who deviate and are different to survive. These individuals are the creative ones China desires.

In other words, what results in Chinese student's superb performance is what causes China's failure of creative individuals. Similarly, what leads to more creative individuals in America is what results in the mediocre performance of American students on international tests. This is called the side effects of education (Zhao, 2017, 2018b). Thus, if the borrowing between China (East Asian education systems) and the U.S. or U.K. (Western education systems) were successful, they would have traded places. However, because the effect is largely cultural, the borrowing is unlikely to be successful.

The Challenge

Driving the mutual borrowing between the West and East is the strong desire to improve education for the future. Efforts to tinker education toward Utopia have been ongoing for a long time (Tyack & Cuban, 1995) without signs of significant progress, especially in comparison to the transformative changes in other fields such as medicine, agriculture, and information technology (Bryk, 2015; Slavin, 2002; Whitehurst, 2002). At the same time, the transformative changes brought about by technological advancement pose great challenges to education (Brynjolfsson & McAfee, 2014; Schwab, 2015; World Economic Forum, 2016; Zhao, 2015c). Unless education catches up in this race against technological changes (Goldin & Katz, 2008), the human society risk economic depression, political turmoil, and social unrest as has been witnessed at the turn of the last century.

Race between Education and Technology

The challenge education faces today is the redefinition of the value of knowledge, skills, and talents. As a consequence of technological changes, societies' need for skills, knowledge, and talents change accordingly (Goldin & Katz, 2008). For example, in the Stone Age, knowledge and skills to work with stones were valuable, but they became less valuable in the Bronze Age. Likewise, when horse wagons were the

primary transportation tool, knowledge and skills related to horses and horse wagons were of great value, but their value decreased when automobiles replaced horse wagons.

Education is thus in a constant race against technological changes. Whenever massive technological changes cause large scale and widespread redefinition of the value of skills and knowledge, education needs to make changes to equip future members of societies with the skills and knowledge needed in the new society instead of continuing to teach those that have lost value. Thus education needs to ask "what knowledge is of most worth" often in response to technological changes, as exemplified by British philosopher Herbert Spencer's essay titled *What Knowledge Is Most Worth* in 1859 in response to the massive changes brought upon society by the Industrial Revolution at the time (Spencer, 1911).

We need to ask this question again. Technological changes over the past few decades have been nothing but transformative. The anticipated changes in the near future are even more so, ushering in a new era for humanity. The new era has been called the Second Machine Age fueled by artificial intelligence in contrast to the First Machine Age driven by the steam engines and electricity (Brynjolfsson & McAfee, 2014); the Fourth Industrial Revolution in contrast to the First, Second, and Third Industrial Revolutions (Schwab, 2015); or Age of Artificial Intelligence (Tegmark, 2017). The names may be different, but the idea is the same: human beings are faced with another major challenge brought about by their own creations.

Redefining the Value of Knowledge and Skills

This challenge has two most fundamental implications. First, technology has rendered a wide range of skills, knowledge, and talents less valuable or completely valueless. Machines have already replaced millions of human workers in manufacturing, construction, banking, retail, and many other traditional industries. Many traditional industries have disappeared. It is certain that as technology further advances, more jobs will be performed by machines and more industries will disappear or be transformed (Brynjolfsson & McAfee, 2014; Schwab, 2015; World Economic Forum, 2016; Zhao, 2009a, 2012). Second, technological advances have also created new opportunities for traditionally undervalued skills and talents (Florida, 2002, 2012; Pink, 2006; Trilling & Fadel, 2009; Wagner, 2012; Zhao, 2009a, 2012). With the loss of jobs in physical retail stores came an increase in jobs for online shop owners. With the decline in manufacturing jobs came the growth in computer jobs.

The knowledge and skills that have become less valuable in the era are those required for routine, mechanical, and repetitive tasks. Traditionally, the same task (job) typically required lots of individuals possessing the same set of skills. Telephone switchboard operators, assembly line workers, bank tellers, and automobile drivers are some of the examples. With machines better at performing the repetitive, mechanical, and routine tasks at ever lowering cost, human beings need to become more human

and less robotic. The new economy has many different kinds of jobs but each job requires only a few people because of hyper-specialization (Malone, Laubacher, & Johns, 2011). Thus, the new skills that have become more valuable are social-emotional competency, creativity, entrepreneurial capabilities, and uniquely great talents (Auerswald, 2012; Florida, 2002, 2012; Pink, 2006; Wagner, 2012; Zhao, 2009a, 2012).

Moreover, technology has also created new challenges facing humanity such as environmental sustainability, rising gap between the poor and rich, international terrorism, organized crimes, and privacy (Glenn, Gordon, & Florescu, 2009; Szombatfalvy, 2010). These challenges are global in nature and transcend national borders. They cannot be addressed by any one organization or nation. Thus, education has the added challenge to help individuals become global citizens who are not only concerned about the interest of their local communities or nations (Asia Society, 2008; Hunter, White, & Godbey, 2006; Noddings, 2005; Zhao, 2009a, 2009b).

However, the traditional paradigm of education is about equipping all children with the same set of skills and knowledge. Its goal is to produce a homogenous workforce with similar abilities. It is not about developing individual talents, creativity, innovative skills, or entrepreneurial capabilities. It is only concerned with cognitive skills, with little attention to social emotional competencies. Moreover, the traditional education paradigm is typically focusing on preparing children for the local physical community they live in, with little concern about the broad global human community (Zhao, 2009a). In order to prepare children to become successful in the new era, education needs much more than tinkering or improvement. It needs a transformation, a paradigm shift (Wagner, 2008, 2012; Zhao, 2012).

A New Paradigm

Luckily, we have the essential raw materials and tools to start conceptualizing and building a new paradigm of education for the future. Advances in understanding of human nature and human learning in recent years provide the theoretical basis for conceptualizing a new paradigm. Technological advances provide added tools for developing a new paradigm. Moreover, the essential basics of the new paradigm have been put into practice around the world and there are valuable lessons to draw upon.

The Raw Materials

Human potentials are the raw materials the new education paradigm relies on to prepare the diverse, creative, and entrepreneurial members of the future society when smart machines perform tasks that require homogenous and mechanical skills. Human

beings have been found to have the potential for diversity, creativity, and entrepreneurial capabilities. They also have the natural psychological need for self-actualization, for achieving greatness.

First, modern research has found that human beings differ on many dimensions. Individuals possess different strengths and weaknesses in talents, with some having more talent in music but less in sports, some being more talented in numbers and logic but less in language, and still some possessing more potential for art but less for interpersonal understanding (Gardner, 1983, 2006). Human beings have also been found to have different profiles of interests and intrinsic motivations with some more driven by power, some by curiosity, some by physical movement, and still some by social connections (Reiss, 2000, 2004). Additionally, humans are born and live in different environments that can strengthen or weaken their innate potentials and motivation. As a result of the interaction between their naturally born capacities and experiences with the environments, or nature via nurture, every human individual has a jagged profile of strengths and weaknesses, constituting the vast diversity of human abilities and interests (Ehrlich, 2000; Pinker, 2003; Ridley, 2003; Rose & Fischer, 2011; Zhao, 2018a). But the diversity had to be suppressed in mass-production economies that required a more homogenous workforce.

Second, the potential to create is a natural human attribute. Human beings are born with the capacity to create (DeFelipe, 2011; Kaufman & Beghetto, 2009; Nettle, 2001; Richards, 2007; Runco, 2007). It is the natural born capacity for being creative that enables human beings to learn to adapt to the different environments they are born in. But again, human creativity needed to be curtailed for practical reasons, especially in societies when workers and citizens were required to follow orders and directions, comply with rules, maintain the status quo, and obey social norms.

Third, humans are born with the foundation to be entrepreneurial (Zhao, 2012, 2018a). Entrepreneurs have been traditionally used to refer to people who establish and operating businesses, but the definition of entrepreneurs has expanded beyond business people to include social entrepreneurs (Dees, 1998; Martin & Osberg, 2007), intrapreneurs (Swearingen, 2008), and entrepreneurs in the public sector (Harris & Kinney, 2004). In essence, an entrepreneur is one who takes innovative actions to proactively create value for others and the world (Drucker, 1985; Kirzner, 1999; Mount, 2009; Nicolaou, Shane, Cherkas, & Spector, 2008; Shane, 2010; Shapero & Sokol, 1982; Ward, 2004). Human beings are born with the desire, the natural need to connect with others, to be of value to other people, and to care and be cared by others (Compton, Hoffman, & Compton, 2012; Deci & Vansteenkiste, 2004). To achieve genuine happiness, human beings need to have a sense being valuable to others and making contribution to the larger world beyond themselves (Koltko-Rivera, 2006; Seligman, 2002, 2011).

Fourth, human beings desire to achieve greatness. The desire to realize one's potential, or to achieve self-actualization, is the highest level of human needs in Abraham Maslow's hierarchy of needs (Maslow, 1954, 1999). According to Maslow (1954), self-actualization is key to ultimate psychological health. Only when one's

profound capacities are actualized, can he be truly happy and healthy mentally or be at peace with himself:

> A musician must make music; an artist must paint, a poet must write, if he is to be ultimately at peace with himself. What a man can be, he must be. (p. 93)

Finally, research suggests children are capable of self-organizing their learning without being 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 (Bransford, Brown, & Cocking, 2000; Gopnik, Meltzoff, & Kuhl, 1999; Meltzoff, 1999; Smilkstein, 2011). They can learn from their peers through collaborative learning (Dillenbourg, 1999; Hamada, 2014; Hmelo-Silver, 2013). They can 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).

Tools at Hand

We have the raw materials that can be developed into successful members of a society in the age of the smart machines. The natural capacities of our children support and desire a new paradigm of education. Moreover, we also have the tools to develop a new paradigm of education.

First, technology has advanced so much that it is a reality that one can learn anything, at anytime, with anyone, from anywhere (Bonk, 2011; Christensen, Horn, & Johnson, 2010). Thus, learning does not need to be confined to the classroom, the school, or any physically isolated place. Learning does not need to depend on the physical presence of a teacher either. This reality broadens learning opportunities beyond schools. Thus schools and teachers do not need to be concerned that they must have all the expertise in order to support the development of a diversity of interests and talents and accommodate different learning styles and patterns (Bransford et al., 2000; Fischer & Bidell, 2006; Fischer & Silvern, 1985; Tomlinson, 2001).

Second, globalization has significantly increased human interactions and movement across cultural and political borders. Learning, too, can be globally organized (Davis & Lindsay, 2012; Friedman, 2007; Zhao, 2009a, 2012). Learning across national and geographical boundaries can be as common as learning in the same classroom. Thus, children can learn from, with, and for people in remote places. Engagement in global learning activities is essential for developing global perspectives and competencies.

Third, theories and practices that support the new educational paradigm have existed for centuries and advanced even more in recent years (Dewey, 1938; Hewitt, 2001; Rousseau, 2011; Zhao, 2012). There has been a competing education philosophy against the traditionally dominant paradigm. Instead of making children

acquire prescribed knowledge and skills, this alternative paradigm is about helping children become themselves. This paradigm does not presuppose or predefine what knowledge or skills are worthwhile. In this paradigm, the "curriculum" is one that follows the child. It begins with the children: what they are interested in, what excites them, what they are capable of, and how they learn. This paradigm does not assume all children are the same; therefore, it does not impose artificial standards or age-based, grade-level expectations. It helps children move forward from where they are. Furthermore, it does not believe children are simply empty vessels ready to be filled with knowledge, but rather it assumes that each child is a purposeful agent who interacts with the outside world. This child-centered philosophy has been advocated and practiced as long as the curriculum-centered paradigm. The great American educator and philosopher Dewey (1938/1998) summarizes the differences between the two paradigms almost 80 years ago in his *Education and Experience:*

> To imposition from above is opposed expression and cultivation of individuality; to external discipline is opposed free activity; to learning from texts and teachers, learning through experience; to acquisition of isolated skills and techniques by drill, is opposed acquisition of them as means of attaining ends which make direct vital appeal; to preparation for a more or less remote future is opposed making the most of the opportunities of present life; to static aims and materials is opposed acquaintance with a changing world. (pp. 5–6)

This child-centered approach has been put into practice in various forms for over a century. For example, John Dewey founded the University of Chicago Lab Schools in 1896; Maria Montessori opened the first *Casa Dei Bambini* or Children's House in 1907. With the first Waldorf School founded in 1919, last century saw the addition and spread of Waldorf education. Shortly after World War II, parents around Reggio Emilia in Italy began to pilot yet another child-centered education approach that has spread across the world: the Reggio Emilia approach believes that children must have control over the direction of their learning and children must be provided endless ways and opportunities to express themselves. In 1921, Alexander Sutherland Neil founded the Summerhill School in Germany and later settled in England. The Summerhill School operates with the philosophy that school should be made to fit the child, instead of making the child fit the school because children learn best when freed from coercion. In 1968 the Sudbury Valley School was established in Massachusetts, USA. Following a similar philosophy as the Summerhill School, the Sudbury School offers no prescribed curriculum and allows students to decide what to do with their time in a democratic environment.

Possible Elements of a New Paradigm of Education

We have the raw materials: the children with the potential to become diverse, creative, entrepreneurial talents that are needed in the new era. The children are

capable of learning and self-organizing. We also have the tools: advanced technology and globalization that make learning anywhere, anytime, from and with anyone around the globe. We also have the theory and decades of experiences of supporting an alternative education paradigm: child-centered education that has been experimented with in various settings in the world. We can begin to conceptualize a new paradigm of education for the future. Drawing on existing research and practices, we believe that the new paradigm should have three core elements.

Personalizable

Education should be personalizable instead of one-size-fits all (Goyal, 2012; Zhao, 2018a). Personalizable education recognizes and cultivates children's strengths instead of fixing their deficits, nurtures individual passions and interests rather than imposing on them a predetermined set of knowledge and skills, and helps children to become active owners of their personal education enterprises instead of turning them into compliant workers on the traditional mechanical education assembly line. High quality personalizable education should include a set of defining features: agency, shared ownership, and flexibility.

Agency. A defining feature of personalizable education is student agency. In order for them to explore, identify, and enhance their strengths and follow their passions, students must become the owner of their learning. They must have agency in designing their own learning, and take control of their own learning. The degree of student agency varies. An easy way to think about the degree of agency students enjoy in a school is the percentage of their total school and school-related time being decided by students. That is, the proportion of time devoted to activities decided by students in consultation with adults. Student agency can vary in the different aspects of their education as well. For example, allowing students to decide what after-school clubs they want to join is not as consequential as enabling them to decide what classes they want to take in terms of supporting students pursuing their strengths and passions. Furthermore, student agency can be granted on different levels. At the highest level, students can make decisions about their learning without constraints of grade levels or age, compulsory courses, or compulsory activities. Students can decide what they want to study, when they want to study it, and how they demonstrate their learning outcomes.

Co-Ownership. Another defining feature of personalizable education is co-ownership. Adults and students in a school are co-owners of the school and what happens in the school. Shared ownership is a way for students to have agency over their educational experiences by being able to contribute to and take responsibility for the culture, infrastructure, and resources in a school. Moreover, in a shared ownership school, students are not only concerned about their own interests but also the interests of others and the community as a whole. Shared ownership is a form of broad-based ownership that has been proposed as an effective way for healthy and

equitable community, business development, and job creation (Blasi, Freeman, & Kruse, 2014; Kelly, 2016). In recent years, there is growing recognition of the benefits of employee-owned business and community-owned institutions such as community-owned banks and grocery stores (Alperovitz, 2005; Blasi et al., 2014; Marjorie Kelly, 2016). Research suggests that broad-based ownership leads to healthier and more balanced growth and development as well as more equity.

Flexibility. Flexibility is another defining feature. In order to maximize room for personalization, a school needs to have maximum flexibility in response to new opportunities, emerging needs, and unexpected problems. Flexibility applies to all aspects of the school: flexible leadership, flexible time table, flexible curriculum, flexible facilities, flexible students, and flexible staffing.

Value Creation and Product-oriented Learning

The new paradigm has another core element: value creation. Personalizable education is not only about supporting students' pursuit of their passion and strength through agency, co-ownership, and flexibility, but also about guiding students to turn their passion and strength into value for others. By creating something valuable, students find purpose in their learning and put in efforts to enhance their strengths. They don't just learn from others, they learn for others as well. This is to enhance children's creativity and develop an entrepreneurial mindset. Product-oriented Learning (POL) (Zhao, 2012, 2016c) is an effective pedagogical approach to support value creation.

POL, or entrepreneurial PBL, has three basic elements: authentic products, sustained and disciplined process, and roles that are strength-based. Learning does not begin with a textbook or predetermined sequence of knowledge and skills. Instead it starts with identifying problems worth solving. The outcome is not a test score, completed worksheets, or an essay to be read and graded only by the teacher. Instead it is a meaningful product, service, or program that solves a problem.

Authentic works need to be of high quality and high quality comes from sustained and disciplined efforts. Thus, POL requires students to go through multiple rounds of reviewing and revision. In POL, students seek feedback from their peers, teachers, potential users of their works, and professionals outside the school. Based on the feedback, they develop more knowledge and skills needed to improve their works. Then they revise and improve.

Being strength-based is about guiding students to discover and develop their strengths and passions. Moreover, it helps students learn to discover and avoid their weaknesses. By helping students find and avoid their weaknesses, POL teaches students to discover other people's strengths and collaborate with them. Unlike traditional PBL that asks students to do similar things, POL suggests that members of a team perform distinctively different tasks and be responsible for different aspects of the project in accordance with each member's strengths.

Globalized Campus

The third core element of the new paradigm of education is the globalized campus (Zhao, 2012, 2016d). In other words, the setting of education is not limited to the classroom or physical campus. New educational institutions should consider the local neighborhood, the community, and the city they are located in as learning settings. Moreover, they should consider the entire world as the campus. Even outer space can be a place for learning.

On the globalized campus, children engage in learning *from* others from anywhere. Other people in remote lands are their instructors, tutors, and mentors. They also engage in learning *with* others. People in other lands can be partners in learning the same way as their classmates. People far apart physically from each other can work on collaborative projects, co-create products, and together solve global problems. Furthermore, children are also engaged in learning *for* others globally. Others are their clients, customers, students, and recipients of their services.

The new paradigm is not entirely new. The three core elements have been implemented in many schools and taken various forms under the traditional paradigm of education, see for example (Zhao, 2012, 2016c, 2016d, 2018a; Zhao & Tavangar, 2016). While the experiments have seen positive results, the changes are not fundamental and significant enough for the future. To meet the challenges facing humanities in the 4th Industrial Revolution, we need to treat the three elements as inseparable from each other. We need to replace the traditional paradigm with this new one entirely.

Inventing the Future: An Opportunity for China

Although the need for educational transformation is widely recognized, the efforts are more focused on improving the old paradigm. The effort to borrow lessons from each other is an example of improving the old paradigm. It is rooted in the assumption the other side has found the secrets of successful education for the future. In other words, it is looking in the past for lessons to create the future. This strategy may work if the future is a replicate of the past or at least is similar. But the future is not. We have come to a time when improving the horse wagon, no matter by how much, will not succeed in reaching Mars. To go to Mars, we need rockets!

The challenge and opportunities brought about by technological changes are universal, not limited to one nation or region. In other words, all education systems must work on shifting the paradigm and inventing the education needed in the future. No education system at this moment hold lessons for the future since every system is at the beginning of this new era. Whoever can invent the future will lead the next era and contribute to human progress in the future.

The opportunity to lead the future in education is equal for every education system in the world. China is certainly no exception. In fact, China may be in a better

position than some other education systems to lead the paradigm shift due to its unique situation at this point in time.

Need for Creativity and Entrepreneurs

China needs a new paradigm of education to prepare citizens needed for its future economy. After 30 years of rapid growth, China's economy began to slow down after 2012. This slow-down is a telling sign that the economic engines that drove China's growth from the 1980s to the first decades of the 21st Century need to be replaced. It is no longer viable and acceptable for China to simply be the "world's factory". Instead, the future of the Chinese economy needs creativity and innovation. The Chinese leadership is keenly aware of the need. In 2015, the Chinese central government made it a national effort to promote mass innovation and entrepreneurship as the new economic engine (State Council of China, 2015). Since then, various economic policies have been enacted to stimulate and support innovation and entrepreneurship in China.

The economic policies can certainly have a significant impact on innovation and entrepreneurship activities, but the impact is limited to those who are inclined and able to engage in innovation and entrepreneurship activities. They have little effect if the masses are not interested in or able to engage in such activities. Thus, ultimately for China to have an economy driven by innovations and entrepreneurship, it needs to have an innovation and entrepreneurship-minded and capable citizenry. This cannot be achieved following the traditional paradigm of education, which was intended and designed to produce employees for an old economy. While every system needs more innovative and entrepreneurial talents, the need is greater in China because of its large population and the traditional shortage of innovative and entrepreneurial talents. For China to escape the "middle income trap", it needs to make an urgent shift toward a new paradigm of education.

Need for Diverse Pathways

China needs a new paradigm of education to reduce talent waste and unnecessary competition. It has long been recognized that a single narrow pathway for success is not viable in China. Each year, each age cohort in China has about 10 to 15 million children. The traditional paradigm prescribes a narrow pathway for all children to go through elementary school, secondary school, and higher education. The tens of millions of children are pushed over a "single log bridge" toward one destination: colleges — not any college, but the best colleges, resulting in massive waste of talents and fierce competition. Moreover, with the expansion of higher education in China, nearly 80% of high school graduates or 50% of the age cohort are admitted to higher education institutions each year. It will not be long when a college degree begins to lose its value as a result of credential inflation (Collins, 1979). China has long been

working on diversifying pathways for success so the tens of millions of children born each year can pursue success in different ways. China's need to diversify is much greater than other education systems because it has a much larger population than most education systems, and traditionally it has had a much narrower pathway than Western countries.

Need for Equity

China also needs a new paradigm of education to address education inequity. China, like many other nations, has been fighting the battle of education equity. Its vast geography, uneven levels of economic development, and historical social stratification, are the major sources of inequity in education. Governments' efforts to fight poverty, balance education resources, and adjust college admission quotas, as well as other creative measures such as teacher rotation and establishing partnerships between high quality schools and low quality schools, can certainly help, but the problem of inequity cannot be fully addressed in the traditional paradigm, which follows the logic of a phony meritocracy (Zhao, 2016a). The phony meritocracy assumes there is only one merit—test scores—that should be used to judge a person's merit for awarding opportunities. As a result, the disadvantaged children in schools are always stuck in disadvantaged situations despite the possibility that they possess other valuable talents and skills that are not translated into school performance. More meaningful ways to address inequity is to broaden the definition of merit and develop every child into uniquely great, creative, and entrepreneurial individuals who can create their own success.

Sustained Efforts in the Right Direction

Another reason China may be in a better position than some countries is that it has launched numerous efforts to drastically change the existing paradigm of education into something better. Albeit with limited success, the Chinese government has never stopped trying. One of the most drastic efforts to alter the traditional education paradigm was the Cultural Revolution (1966–1976). Although generally viewed as a controversial political movement with disastrous consequences, the Great Cultural Revolution had an element of education reform. One of the targets of this Revolution was the traditional exam-driven education paradigm. Exams have been considered the source of all evils in China (Yang, 2006a). For example, the paramount Chinese leader Mao Zedong, who started this movement, hated test scores and tests. "Testing treats students as enemies and are often launched against them in an ambush", wrote Mao in 1964, "It works against the active and lively development of youth morally, intellectually, and physically" (Mao, 1967, p. 54). "Using test scores as the only measure for college admissions and advocating 'everyone is equal before test scores' are in reality a culture tyranny imposed upon the working people by the capitalist

class" (Li, 1970).

Moreover, *Mao* wanted to install a new education paradigm freed from the Confucian and *keju* tradition. He envisioned and forced the implementation of an education system to serve the masses, not the few intellectual elites—the traditional scholars who "never labor their limbs and unable to tell different crops". In his view, education must be rooted in the daily activities and experiences of the people. Despite the failure of the Cultural Revolution, *Maos'* radical and idealistic pursuit of an educational utopia has been reexamined in recent years. Many scholars agree that his intention to fight against the authoritarianism and intellectualism in Chinese education was well justified (Yang, 2006).

After the Cultural Revolution, China restored its education system. The fight against the negative consequences of a test-driven education continued, albeit much less radically than the Cultural Revolution (Zhao, 2014, 2015b). Reducing academic burden, decreasing the importance of exams in education, exploring more flexible ways for college admissions, and addressing inequity have been the major themes of these efforts. These reforms touched on school financing, curriculum, governance, admission, testing, teacher education, educational technology, school autonomy, and a host of other aspects of education.

The persistent reform efforts in China are all directed at chipping away the old education paradigm and moving toward a new one. In contrast, Western education systems have been engaged in efforts to move backwards, to strengthen the existing paradigm. The resolve and experiences with the right kind of reforms to move to a new paradigm put China in a better position to lead the change.

Experiences with Managing Large Scale Changes

China's experiences with launching and managing large-scale experiments is another reason to believe that China could be the leader in shifting the education paradigm. The grand economic experiment in Shenzhen is an example. In 1980 when China's entire national economy was strictly operating under the paradigm of communism, the Chinese government decided to make Shenzhen, a small fishing village bordering Hong Kong, a Special Economic Zone to allow foreign investments and trade and experiment with the paradigm of capitalist market economy. The experiment transformed Shenzhen into a global cosmopolitan community. The small fishing village numbering about 30,000 people 40 years ago is one of the largest economic hubs with a population of 10 million today. More important, the experiment in Shenzhen led the way for China to adopt the market economy paradigm and other practices that contributed to China's economic development over the past few decades.

China has similar experiences starting and managing similar large-scale changes in education as well. A recent example is the rollout of the College Entrance Exam and Admissions reform started in 2014 (Zhao, 2015a). The changes are big, and the goal was to transform college entrance exams, one of the toughest issues in Chinese

education, for the entire nation. But instead of pushing the changes to all provinces at once, the Chinese government started with a pilot in a limited number of jurisdictions: Shanghai and Zhejiang.

China is very experienced with carving out special zones for radical experiments. This approach of piloting big changes in small areas allows policy makers to learn the effects, both positive and negative, of the changes and make necessary adjustments before rolling out to the entire nation. Moreover, it creates examples of change, so others can learn from these examples. Most important, it helps to ease possible resistance and anxiety that naturally exist when big changes occur.

Rising Parental Demand for Alternatives in Education

A final favorable condition for China to leapfrog into the new paradigm of education is the rising parental demand for alternative paradigms of education. The growing middle class resulted from China's economic growth have become increasingly dissatisfied with the current education. More important the newly acquired financial resources enable them to seek alternative forms of education. While some send their children overseas, others send their children to Western-style schools. Still others send their children to Western-style afterschool programs or online Western-style tutoring with tutors from overseas. The enthusiasm for alternative forms of education and the massive investment by parents in alternative forms of education could be channeled to shifting the education paradigm.

Leading the Future: Recommendations

Paradigm shifting is not an easy overnight job. It takes a long time and lots of efforts. But it has to start first. Although China has the desire, the need and the conditions to lead the paradigm shift, it faces tremendous challenges. In other words, the possibilities exist, but whether China can be the leader of the next paradigm of education is far from certain. To start the shift, China, and any education system for this matter, can benefit from considering a number of issues.

Long-term View

Education itself is a long-term and future-oriented enterprise. A child entering school in 2018 will graduate from high school in 2030. Given the rapid changes in society, 2030 is assured to be drastically different from 2018. Furthermore, education reform efforts take years to implement and begin to have effect. Imagine that we begin developing and researching a new education paradigm in 2018; it would take at least a few years to come up with a framework and convince schools and governments to

begin the experiment. Assuming the experiment begins in 2022, students experiencing the new paradigm will graduate from high school in 2036. It will take at least another decade to have system wide implementation. In other words, if we start working on the paradigm shift today, the students experiencing the new paradigm *en mass* are adults who will live in the 2050s.

Education changes are thus in a dilemma because policy makers, education practitioners, and parents often hold a very short-term view about education. They expect immediate outcomes that are consistent with their expectations and values, but their expectations and values are derived from their past. To make the change requires first a more rational mindset about educational transformations along with adoption of a long-term perspective.

Courage and Confidence

It requires courage and confidence to make big changes such as a paradigm shift. This is especially true in the case of China, which suffers from the colonial mentality in education thinking. Although China was never fully colonized by Western powers, the view that Western education is superior is widespread as a result of borrowing Western education ideas for over a century and the apparent technological and scientific advancement made in Western countries. As discussed earlier in this article, the West indeed had a lot of lessons to offer to China, but that has come to an end. China has learned what is learnable from the West. Additionally, the recent reform efforts in the West have actually turned their education systems more Chinese or Asian. Thus, China should have the courage and confidence to not copy the West anymore and instead begin to invent the future.

Development and Research

Although this article outlines a conceptualization of a new education paradigm, it is a long way from conceptualization to implementation. Beyond the general orientations and possible features of the new paradigm of education discussed in this article, a lot more specifics need to be developed and tested. The development and research efforts should not be constrained by the current education paradigm. We should not be consumed by questions about how the new paradigm works with current schools, teachers, parents, or college admissions. We must remember that the new paradigm will serve students 10 years later.

The development and research of a new paradigm should draw on research and development beyond traditional education research, which has been constrained by the traditional paradigm of education. Instead, we should actively seek insights from other fields and disciplines. Information technology, artificial intelligences, neurosciences, psychology, businesses, ethics, economics, and sociology are some of the fields from which we can draw insights.

Invitation to Innovate

One strategy to begin the shift to a new paradigm of education is to invite the early adopters to innovation instead of imposing the innovation on unwilling or even resistant populations. The experiment should start small. Instead of imposing on all schools or all students in a school or education system, we can start with a small group of students within a school or a small number of schools within a system, just like China did with the Shenzhen Special Economic Zone.

An Uncertain Future: Conclusions

This article presents the case for a paradigm shift in education. It presents evidence to show why it is futile and detrimental for China to continue to borrow lessons from the West and for the West to borrow lessons from China. It does not mean there are not lessons to be learned, but rather many of the lessons they wish to learn from each other are cultural and cannot be borrowed. More important, even if the lessons were learned, it only amounts to improvement of an obsolete paradigm of education that is insufficient to meet the challenges brought about by technological revolutions.

China may be poised to lead the paradigm shift, to be the first to enter the new era of education. But there is no guarantee. The past can serve as a mirror. By the end of *Ming Dynasty* (1368–1644), China had the condition to begin the Industrial Revolution. "Most scholars believe that, as early as in the early period of Ming Dynasty (14th century), China had acquired all the major elements that were essential for the British Industrial Revolution in the 18th century", according to Justin Yifu Lin, former vice president of the World Bank and a well known professor of economics at Peking University, after reviewing the literature about pre-modern China (Lin, 2006, p. 5). In other words, China was almost ready for the Industrial Revolution over 100 years earlier than Britain. "However, industrial revolution occurred in Britain instead of China and Chinese economy was quickly overtaken and lagged behind by western countries" (Lin, 2006, p. 5).

We certainly hope China can take the lead. If not, someone else will, sooner or later. If no one takes the lead, human civilizations may be in jeopardy. History shows if a civilization fails to anticipate future changes and challenges and take actions in advance, it is doomed to collapse (Diamond, 2005; Toynbee, 1948).

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References

Alperovitz, G. (2005). *America beyond capitalism: Reclaiming our wealth, our liberty, and our democracy*. Hoboken, NJ: J. Wiley.

Asia Society. (2008). *Going global: Preparing our students for an interconnected world*. New York, NY: Asia Society.

Auerswald, P. (2012). *The coming prosperity: How entrepreneurs are transforming the global economy*. New York, NY: Oxford University Press.

Bailey, N. E. (2016). *The power of project-based learning: Helping students develop important life skills*. Lanham: Rowman & Littlefield.

Baker, D. P., Akiba, M., LeTendre, G. K., & Wiseman, A. W. (2001). Worldwide shadow education: Outside-school learning, institutional quality of schooling, and cross-national mathematics achievement. *Educational Evaluation and Policy Analysis, 23*(1), 1–17.

Barber, M., Donnelly, K., & Rizvi, S. (2012). *Oceans of innovation: The Atlantic, the Pacific, global leadership and the future of education*. Retrieved from http://www.ippr.org/images/media/files/publication/2012/09/oceans-of-innovation_Aug2012_9543.pdf.

Barber, M., & Mourshed, M. (2007). *How the world's best-performing school systems come out on top*. Retrieved from https://www.mckinsey.com/industries/social-sector/our-insights/how-the-worlds-best-performing-school-systems-come-out-on-top.

Beghetto, R. A. (2013). *Killing ideas softly?: The promise and perils of creativity in the classroom*. Charlotte, NC: Information Age Publishing.

Beghetto, R. A., & Kaufman, J. C. (2010). *Nurturing creativity in the classroom*. Cambridge ; New York, NY: Cambridge University Press.

Blasi, J. R., Freeman, R. B., & Kruse, D. (2014). *The citizen's share: Reducing inequality in the 21st century*. New Haven: Yale University Press.

Bonk, C. J. (2011). *The world is open: How web technology is revolutionizing education*. San Francisco, CA: Jossey-Bass.

Boylan, M. (2016, December 11). Here's why East Asian students consistently outpace their Western peers. *Business Insider*. Retrieved from http://www.businessinsider.com/heres-why-east-asian-students-consistently-outpace-their-western-peers-2016-12.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: The National Academies Press.

Bray, T. (1999). *The shadow education system: Private tutoring and its implications for planners.* Paris: UNESCO International Institute for Educational Planning.

Bryk, A. S. (2015). *Learning to improve: How America's schools can get better at getting better*. Cambridge, MA: Harvard Education Press.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. New York, NY: W. W. Norton & Company.

Chen, C.-S., Lee, S.-Y., & Stevenson, H. W. (1996). Academic achievement and motivation of Chinese students: A cross-national perspective. In S. Lau (Ed.), *Growing up the Chinese way: Chinese child and adolescent development* (pp. 69–91). Hong Kong: Chinese University Press.

Cheng, K.-M. (2011). Shanghai: How a big city in a developing country leaped to the head of the class. In M. S. Tucker (Ed.), *Surpassing Shanghai: An agenda for American education built on the world's leading systems* (pp. 21–50). Cambridge, MA: Harvard Education Press.

Christensen, C. M., Horn, M. B., & Johnson., C. W. (2010). *Disrupting class, expanded edition: How disruptive innovation will change the way the world learns* (2nd ed.). New York, NY: McGraw-Hill.

Collins, R. (1979). *The credential society: A historical sociology of education and stratification*. New York, NY: Academic Press.

Common Core State Standards Initiative. (2011). *Common Core State Standards Initiative.* Retrieved from http://http://www.corestandards.org/.

Compton, W. C., Hoffman, E., & Compton, W. C. (2012). *Positive psychology: The science of human flourishing* (2nd ed.). Belmont, CA: Wadsworth, Cengage Learning.

Cotter, K. N., Pretz, J. E., & Kaufman, J. C. (2016). Applicant extracurricular involvement predicts creativity better than traditional admissions factors. *Psychology of Aesthetics, Creativity, and the Arts, 10* (1), 2.

Coughlan, S. (2012, May 8). *China: The world's cleverest country?* Retrieved from http://www.bbc.co.uk/news/business-17585201.

Dacey, J., & Packer, A. (1992). *The nurturing parent: How to raise creative, loving, responsible children*. New York, NY: Simon & Schuster.

Dacey, J. S., & Lennon, K. H. (1998). *Understanding creativity: The interplay of bilogical, psychological, and social factors*. San Francisco: Jossey-Bass.

Davis, V., & Lindsay, J. (2012). *Flattening classrooms, engaging minds: Move to global collaboration one step at a time*. New York, NY: Pearson.

Deci, E. L., & Vansteenkiste, M. (2004). Self-determination theory and basic need satisfaction: Understanding human development in positive psychology. *Ricerche di Psichologia, 27*(1), 23–40.

Dees, J. G. (1998). *The meaning of "social entrepreneurship"*. Retrieved from http://www.caseatduke.org/documents/dees_sedef.pdf.

DeFelipe, J. (2011). The evolution of the brain, the human nature of cortical circuits, and intellectual creativity. *Frontiers in Neuroanatomy, 5*, 29.

Dewey, J. (1938). *Experience and education*. New York, NY: Collier Books.

Dewey, J. (1938/1998). *Education and experience: The 60th anniversary edition*. Indianapolis, IN: Kappa Delta Pi.

Diamond, J. M. (2005). *Collapse: How societies choose to fail or succeed*. New York, NY: Viking.

Diffily, D., & Sassman, C. (2002). *Project-based learning with young children*. Portsmouth, NH: Heinemann.

Dillenbourg, P. (1999). *Collaborative learning: Cognitive and computational approaches*. Amsterdam; New York, NY: Pergamon.

Drucker, P. (1985). *Innovation and entrepreneurship*. New York, NY: Harper & Row.

Ehrlich, P. R. (2000). *Human natures: Genes, cultures, and the human prospect*. New York, NY: Penguin Books.

Elmore, R. (2011, May 18). *What happens when learning breaks out in rural Mexico?* Retrieved from http://blogs.edweek.org/edweek/futures_of_reform/2011/05/what_happens_when_learning_breaks_out_in_rural_mexico.html.

Feniger, Y., & Lefstein, A. (2014). How not to reason with PISA data: An ironic investigation. *Journal of Education Policy, 29*(6), 845–855.

Fischer, K. W., & Bidell, T. R. (2006). Dynamic development of action and thought. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (6th ed.) (Vol. 1, pp. 313–399). New York, NY: John Wiley & Sons.

Fischer, K. W., & Silvern, L. (1985). Stages and individual differences in cognitive development. *Annual Review of Psychology, 36*, 613–648.

Florida, R. (2002). *The rise of the creative class and how it's transforming work, leisure, community & everyday life*. New York, NY: Basic Books.

Florida, R. (2012). *The rise of the creative class: Revisited* (2nd ed.). New York, NY: Basic Books.

Friedman, T. L. (2007). *The world is flat: A brief history of the twenty-first century*. New York, NY: Farrar, Straus and Giroux.

Gajda, A., Beghetto, R. A., & Karwowski, M. (2017). Exploring creative learning in the classroom: A multi-method approach. *Thinking Skills and Creativity, 24*, 250–267.

Gao, G. (2003). Encountering American education. *Beijing Literature,* (10), 6–35. (in Chinese)

Gao, H. (2015, February 10). *China's wealthy parents are fed up with state-run education: Forget rote memorization and pressure-packed tests—Western, alternative learning is the new rage.* Retrieved from https://foreignpolicy.com/2015/02/10/chinas-wealthy-parents-are-fed-up-with-state-run-education/.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York, NY: Basic Books.

Gardner, H. (2006). *Multiple intelligences: New horizons* (Rev. and updated ed.). New York, NY: BasicBooks.

Gatto, J. T. (2002). *Dumbing us down: The hidden curriculum of compulsory schooling*. Gabriola Island, Canada: New Society Publishers.

Glenn, J. C., Gordon, T. J., & Florescu, E. (2009). *2009 state of the future* (T. M. Project Ed.). Washington, DC: The Millennium Project.

Goldin, C., & Katz, L. F. (2008). *The race between education and technology*. Cambridge, MA: Harvard University Press.

Gopnik, A., Meltzoff, A. N., & Kuhl, P. K. (1999). *The scientist in the crib: Minds, brains, and how children learn*. New York, NY: William Morrow & Co.

Goyal, N. (2012). *One size does not fit all: A student's assessment of school*. New York, NY: Alternative Education Resource Organization.

Haas, B., & Weale, S. (2017, March 20). Chinese maths textbooks to be translated for UK schools. *The Guardian.* Retrieved from https://www.theguardian.com/education/2017/mar/20/chinese-maths-textbooks-to-be-translated-for-uk-schools.

Hamada, M. (2014). *Active and collaborative learning: Practices, problems and prospects*. New York, NY: Nova Science Publishers.

Harel, I., & Papert, S. (1991). *Constructionism*. New York, NY: Ablex Publishing.

Harris, M., & Kinney, R. (Eds.). (2004). *Innovation and entrepreneurship in state and local government*. Lanham, MA: Lexington Books.

Hewitt, V. (2001). Examining the Reggio Emilia approach to early childhood education. *Early Childhood Education Journal, 29*(2), 95–10.

Hmelo-Silver, C. E. (2013). *The international handbook of collaborative learning*. New York, NY: Routledge,Taylor & Francis Group.

Hofstede, G. (1984). Cultural dimensions in management and planning. *Asia Pacific Journal of Management, 1*(2), 81–99.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations* (2nd ed.). Thousand Oaks, CA: SAGE.

Hunter, B., White, G. P., & Godbey, G. C. (2006). What does it mean to be globally competent? *Journal of Studies in International Education, 10*(3), 267–285.

Hurst, G. (2016, April 19). State school joins rush to sell British education to China. *The Sunday Times.* Retrieved from https://www.thetimes.co.uk/article/state-school-joins-rush-to-sell-british-education-to-china-pqsplmbsf.

Jensen, B. (2012). *Catching up: Learning from the best school systems in East Asia*. Retrieved from http://www.grattan.edu.au/publications/129_report_learning_from_the_best_main.pdf.

Kaufman, J. C., & Beghetto, R. A. (2009). Beyond big and little: The four C model of creativity. *Review of General Psychology, 13*(1), 1–12.

Kirzner, I. M. (1999). Creativity and/or alertness: A reconsideration of the Schumpeterian entrepreneur. *Review of Austrian Economics, 11*, 5–17.

Koltko-Rivera, M. E. (2006). Rediscovering the later version of Maslow's hierarchy of needs: Self-transcendence and opportunities for theory, research, and unification. *Review of General Psychology, 10*(4), 302–317.

Leung, F. K. S. (2002). Behind the high achievement of East Asian students. *Educational Research and Evaluation: An International Journal on Theory and Practice, 8*(1), 87–108.

Li, Z. (1970, September 21). Let's all pay attention to college admissions. *People's Daily*. (in Chinese)

Lin, J. (2006). *Needham puzzle, Weber question and China's miracle: Long term performance since the Sung Dynasty*. Paper presented at the World Economic Performance: Past, Present and Future—Long Term Performance and Prospects of Australia and Major Asian Economies, Brisbane, Australia. Retrieved from http://www.uq.edu.au/economics/cepa/docs/seminar/papers-nov2006/Lin-Paper.pdf.

Malone, T. W., Laubacher, R. J., & Johns, T. (2011). The big idea: The age of hyperspecialization. *Harvard Business Review, 2011*(July–August), 1–11.

Mao, Z. (1967). *Chairman Mao on educational revolution*. Beijing: People's Publishing House. (in Chinese)

Marjorie Kelly, S. D., & Duncan, V. (2016). *Broad-based ownership models as tools for job creation & community development: A guide to how community development is using broad-based ownership models to help low-and moderate-income communities*. Retrieved from http://democracycollaborative.org/content/broad-based-ownership-models-tools-job-creation-and-community-development.

Martin, R. L., & Osberg, S. (2007). Social entrepreneurship: The case for definition. *Stanford Social Innovation Review,* (Spring), 29–39.

Maslow, A. H. (1954). *Motivation and personality*. New York, NY: Harper.

Maslow, A. H. (1999). *Toward a psychology of being* (3rd ed.). New York, NY: J. Wiley & Sons.

Meltzoff, A. N. (1999). Born to learn: What infants learn from watching us. In N. F. J. G. Worhol (Ed.), *The role of early experience in infant development* (pp. 1–10). Skillman, NJ: Pediatric Institute Publications.

Meyer, H.-D., & Schiller, K. (2013). Gauging the role of non-educational effects in large-scale assessments: Socio-economics, culture, and PISA outcomes. In H.-D. Meyer & A. Benavot (Eds.), *PISA, power, and policy: The emergence of global educational governance* (pp. 207–224). Oxford, UK: Symposium Books.

Mitra, S. (2012). *Beyond the hole in the wall: Discover the power of self-organized learning*. New York, NY: TED Books.

Mount, I. (2009, December 9). *Are entrepreneurs born or made? Scientists and academics battle out the nature-vs-nurture debate.* Retrieved from http://money.cnn.com/2009/12/09/smallbusiness/entrepreneurs_born_not_made.fsb/.

Nettle, D. (2001). *Strong imagination: Madness, creativity, and human nature.* Oxford: Oxford University Press.

Nicolaou, N., Shane, S., Cherkas, L., & Spector, T. D. (2008). The influence of sensation seeking in the heritability of entrepreneurship. *Strategic Entrepreneurship Journal, 2*(1), 7–21.

Noddings, N. (Ed.) (2005). *Educating citizens for global awareness*. New York, NY: Teachers College Press.

OECD. (2011). *Strong performers and successful reformers in education: Lessons from PISA for the United States*. Retrieved from http://dx.doi.org/10.1787/9789264096660-en.

OECD. (2017). *PISA 2015 results: Students' well-being*. Retrieved from http://www.keepeek.com/Digital-Asset-Management/oecd/education/pisa-2015-results-volume-iii_9789264273856-en-.Wk1WGrQ-fOQ#page1.

Papert, S. (1993). *The children's machine: Rethinking school in the age of the computer*. New York, NY: Basic Books.

Piaget, J. (1957). *Construction of reality in the child*. London: Routledge & Kegan Paul.

Pink, D. H. (2006). *A whole new mind: Why right-brainers will rule the future*. New York, NY: Riverhead.

Pinker, S. (2003). *The blank slate: The modern denial of human nature*. New York, NY: Penguin.

Pretz, J. E., & Kaufman, J. C. (2015). Do traditional admissions criteria reflect applicant creativity? *The Journal of Creative Behavior,* (51), 240–251.

Qin, A. (2017, August 6). Britain turns to Chinese textbooks to improve its Math scores. *The New York Times*. Retrieved from https://www.nytimes.com/2017/08/05/world/asia/china-textbooks-britain.html?_r=0.

Reiss, S. (2000). *Who am I? The 16 basic desires that motivate our behavior and define our personality*. New York, NY: Jeremy P. Tarcher/Putnam.

Reiss, S. (2004). Multifaceted nature of intrinsic motivation: The theory of 16 basic desires. *Review of General Psychology, 8*(3), 179–183.

Richards, R. E. (2007). *Everyday creativity and new views of human nature: Psychological, social, and spiritual perspectives.* Washington, DC: American Psychological Association.

Ridley, M. (2003). *Nature via nurture: Genes, experience, and what makes us human*. New York, NY: HarperCollins.

Rose, L. T., & Fischer, K. W. (2011). Intelligence in childhood. In R. J. Sternberg & S. B. Kaufman

(Eds.), *The Cambridge handbook of intelligence* (pp. 144–173). New York, NY: Cambridge University Press.

Rousseau, J.-J. (2011). *Emile, or on education.* Retrieved from http://www.gutenberg.org/catalog/world/readfile?fk_files=2232329.

Runco, M. A. (2007). To understand is to create: An epistemological perspective on human nature and personal creativity. In R. Richards (Ed.), *Everyday creativity and new views of human nature: Psychological, social, and spiritual perspectives* (pp. 91–107). Washington, DC: APA.

Satchell, G. (2014, March 12). Shanghai maths teachers brought to England to raise standards. *BBC World Service.* Retrieved from http://www.bbc.com/news/av/education-26541586/shanghai-maths-teachers-brought-to-england-to-raise-standards.

Schwab, K. (2015). The Fourth Industrial Revolution: What it means and how to respond. *Foreign Affairs, December 12*.

Seligman, M. E. P. (2002). *Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment*. New York, NY: Free Press.

Seligman, M. E. P. (2011). *Flourish: A visionary new understanding of happiness and well-being*. New York, NY: Free Press.

Shane, S. A. (2010). *Born entrepreneurs, born leaders: How your genes affect your work life*. New York, NY: Oxford University Press.

Shapero, A., & Sokol, L. (1982). The social dimensions of entrepreneurship. In C. Kent, D. Sexton, & K. Vesper (Eds.), *The encyclopedia of entrepreneurship* (pp. 72–90). Englewood Cliffs, JVJ: Prentice-Hall.

Sharma, Y. (2016, February 24). Asia drives demand for international schools. *BBC World Service.* Retrieved from http://www.bbc.com/news/business-35533953.

Shimshock, R. (2017, October 5). Common Core faces even more resistance with Trump's second-in-command education guy. *Daily Caller*. Retrieved from http://dailycaller.com/2017/10/05/common-core-faces-even-more-resistance-with-trumps-second-in-command-education-guy/.

Slavin, R. E. (2002). Evidence-based education policies: Transforming educational practice and research. *Educational Researcher, 31*(7), 15–21.

Smilkstein, R. (2011). *We're born to learn: Using the brain's natural learning process to create today's curriculum* (2nd ed.). Thousand Oaks, CA: Corwin Press.

Spencer, H. (1911). What knowledge is of most worth. In H. Spencer (Ed.), *Essays on Education and Kindred Subjects* (pp. 1–44). London: Dent/Aldine Press.

State Council of China. (2015, June 16). *Measures to rigorously pomote mass innovation and entrepreneurship.* Retrieved from http://www.gov.cn/zhengce/content/2015-06/16/content_9855.htm. (in Chinese)

Stevenson, H. W., & Stigler, J. W. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education*. New York, NY: Simon & Schuster.

Swearingen, J. (2008, April 10). *Great intrapreneurs in business history.* Retrieved from http://www.cbsnews.com/8301-505125_162-51196888/great-intrapreneurs-in-business-history/.

Szombatfalvy, L. (2010). *The greatest challenges of our time* (R. Skole, Trans.). Retrieved from https://api. globalchallenges. org/static/files/the-great-challenges-of-our-time. pdf.

Tegmark, M. (2017). *Life 3.0: Being human in the age of artificial intelligence* (1st ed.). New York, NY: Alfred A. Knopf.

Thomas, J. W. (2000). *A review of research on Pproject-based learning*. Retrieved from http://www.bie.org/index.php/site/RE/pbl_research/29.

Tocqueville, A. (2003). *Democracy in America*. Washington, DC: Regnery Publishing.

Tomlinson, C. A. (2001). *How to differentiate instruction in mixed-ability classrooms*. Alexandria, VA: ASCD.

Toynbee, A. J. (1948). *Civilization on trial*. Oxford: Oxford University Press.

Trilling, B., & Fadel, C. (2009). *21st Century skills: Learning for life in our times*. San Francisco: John Wiley & Sons.

Tucker, M. (Ed.) (2011a). *Surpassing Shanghai: An agenda for American education built on the world's leading systems*. Boston: Harvard Education Press.

Tucker, M. (2011b). *Standing on the shoulders of giants: An American agenda for education reform*. Retrieved from http: //www.ncee.org/wp-content/uploads/2011/05/Standing-on-the-Shoulders-of-Giants-An-American-Agenda-for-Education-Reform.pdf.

Tucker, M. (2014). *Chinese lessons: Shanghai's rise to the top of the PISA league tables*. Retrieved from Washington, DC: http://www.ncee.org/wp-content/uploads/2013/10/ChineseLessonsWeb.pdf.

Tucker, M. (2016, February 29). Asian countries take the U.S. to school. *The Atlantic.* Retrieved from https://www.theatlantic.com/education/archive/2016/02/us-asia-education-differences/471564/.

Tyack, D., & Cuban, L. (1995). *Tinkering toward utopia: A century of public school reform*. Cambridge, Mass.: Harvard University Press.

Ujifusa, A. (2014, April 21). Resistance to the Common Core mounts. *Education Week.* Retrieved from https://www.edweek.org/ew/articles/2014/04/23/29cc-backlash.h33.html.

Wagner, T. (2008). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need—And what we can do about it*. New York, NY: Basic Books.

Wagner, T. (2012). *Creating innovators: The making of young people who will change the world*. New York, NY: Scribner.

Ward, T. B. (2004). Cognition, creativity, and entrepreneurship. *Journal of Business Venturing, 19*. DOI: 10.1016/s0883-9026(03)00005-3.

West-Knights, I. (2017, January 27). Why are schools in China looking West for lessons in creativity? *Financial Times*. Retrieved from https://www.ft.com/content/b215c486-e231-11e6-8405-9e5580d6e5fb.

Whitehurst, G. J. R. (2002, Feburary 28). *Statement of Grover J. (Russ) Whitehurst, Assistant Secretary for Research and Improvement, before the Subcommittee on Education Reform, U.S. House of Representatives.* Retrieved from https://ies.ed.gov/director/speeches2002/02_28/2002_02_28.asp.

World Economic Forum. (2016). *The future of jobs: Employment, skills and workforce strategy for the Fourth Industrial Revolution*. Retrieved from http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf.

Wren, D. J. (1999). School culture: Exploring the hidden curriculum. *Adolescence, 34*(135), 593.

Yang, D. (2006, October 20). *Cultural Revolution and education utopia*. Retrieved from http://theory.people.com.cn/GB/68294/72286/72288/4939387.html. (in Chinese)

Young, M. D. (1959). *The rise of the meritocracy, 1870–2033: The new elite of our social revolution*. New York, NY: Random House.

Young, M. D. (2001, June 28). Down with meritocracy. *The Guardian*. Retrieved from http://www.

theguardian.com/politics/2001/jun/29/comment.

Zhao, Y. (2009a). *Catching up or leading the way: American education in the age of globalization*. Alexandria, VA: ASCD.

Zhao, Y. (2009b). Needed: Global villagers. *Educational Leadership, 67*(1), 60–65.

Zhao, Y. (2012). *World class learners: Educating creative and entrepreneurial students*. Thousand Oaks, CA: Corwin.

Zhao, Y. (2014). *Who's afraid of the big bad dragon: Why China has the best (and worst) education system in the world.* San Francisco: Jossey-Bass.

Zhao, Y. (2015a, May 9). *The dawn of a new era: China's College Entrance Exam transformation.* Retrieved from http://zhaolearning.com/2015/05/09/the-dawn-of-a-new-era-china%E2%80%99s-college-entrance-exam-transformation/.

Zhao, Y. (2015b). *Lessons that matter: What we should learn from Asian school systems*. Retrieved from Melbourne: http://www.mitchellinstitute.org.au/reports/lessons-that-matter-what-should-we-learn-from-asias-school-systems/.

Zhao, Y. (2015c). A world at risk: An imperative for a paradigm shift to cultivate 21st century learners. *Society, 52*(2), 129–135.

Zhao, Y. (2016a). From deficiency to strength: Shifting the mindset about education inequality. *Journal of Social Issues, 72*(4), 716–735.

Zhao, Y. (2016b). Numbers can lie: The meaning and limitations of test scores. In Y. Zhao (Ed.), *Counting what counts: Reframing education outcomes* (pp. 13–30). Bloomington, IN: Solution Tree.

Zhao, Y. (2016c). *The take-action guide to world class learners. Book 2, How to "make" product-oriented learning happen*. Thousand Oaks, CA: Corwin, A SAGE Company.

Zhao, Y. (2016d). *The take-action guide to world class learners. Book 3, How to create a campus without borders*. Thousand Oaks, CA: Corwin, A SAGE Company.

Zhao, Y. (2016e). Who's afraid of PISA: The fallacy of international assessments of system performance. In A. Harris & M. S. Jones (Eds.), *Leading futures* (pp. 7–21). Thousand Oaks, CA: Sage.

Zhao, Y. (2017). What works can hurt: Side effects in education. *Journal of Educational Change, 18*(1), 1–19.

Zhao, Y. (2018a). *Reach for greatness: Personalizable education for all children*. Thousand Oaks, CA: Corwin.

Zhao, Y. (2018b). *What works can hurt: Side effects in education*. New York, NY: Teachers College Press.

Zhao, Y., & Tavangar, H. S. (2016). *World class learners: Personalized education for autonomous learning and student-driven curriculum*. Thousand Oaks, California: Corwin.

Zheng, Y. (2013, Decemeber 15). Chinese education cannot produce Nobel Prize winners. *Tencent Culture.* Retrieved from http://cul.qq.com/a/20131211/ 014042.htm. (in Chinese)