

International Experiences of Educational Technology Policies: Lessons for Developing Countries

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Abstract: Since computer education was introduced into the educational systems in the developed world in the early 1980s, educational technology policies (ETPs) have become a hot issue, especially in the new millennium. Based on the comparative analysis approach, this study explained what the ETPs are and why and how the policy makers of USA, UK and China were interesting to develop several revised ETPs on the national levels. It finds that policy makers were keen to invest in ETPs because it contributes to the social and economic development, strengthens the national ideology and culture, and supports the educational reforms. Common factors shaping ETPs include policy or vision and authorizing implementation, teachers' professional development, ICT for education infrastructure (digital learning resources, physical hardware infrastructure, internet connectivity in the educational institutions, education management information systems (EMIS) and national research and education networks), and educational technology standards for all of those people who are involved in the educational process.

Keywords: Common Factors, Educational Technology Policies, Information Communication Technology, Policy Makers.

1. Introduction

The 1980s witnessed the introduction of information communication technology into some developed countries. The starting time for US to introduce computers in education was in 1983 (Plomp and Pelgrum, 1991). In early 1981, the British Broadcasting Corporation (BBC) started to make computers available for teachers from a wide range of subject contents based on BBC literacy project (Millwood 2009).

A remarkable report "Nation at Risk" published by US Department of Education (USDE) was reported on some issues related to technological innovation and computer education (USDE, 1983), the early steps of practical introducing ICT in education had come before the developing integrated visions for ICT in education in both USA and UK (Plomp and Pelgrum, 1991). The first formal National Educational Technology Plan (NETP) in the world was published by the USDE in 1996 (NETP, 1996), but before that in early 1990s the US released the National Information infrastructure (NII), which was a foundation for introducing ICT to American education. NII has constructed a system which allows the US citizens to take advantages in educational setting (Fluckiger, 1995). In 1985, Chinese policy makers developed educational reform policy at all levels of education to meet the emerging needs of China's socio-economic development, including some insights on educational technology. (Xiao, 2010)

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Haddad (1995) defines the policies as “an explicit or implicit single decision or group of decisions which may set out directives for guiding future decisions, initiate or retard action, or guide implementation of previous decisions”. According to Global E. Schools Communities Initiative GESCI (2009), “policy is a set of principles or a broad course of action that guides the behavior of governments, organizations, corporations and individuals. Cooper et al. (2004) indicates that policy theories can assemble along four dimensions structural, normative, constituent, and technical (GESCI, 2009). The educational planners look at the policy framework as a key pillar for reforms, the framework of policy itself should include pre-policy, policy process and post- policy process. Haddad (1995) identifies seven policy planning process, including: analysis of the existing situation, the generation of policy options, evaluation of policy options, making the policy decision, planning of policy implementation, policy impact assessment, and subsequent policy cycles. UNESCO (1998) defines ICT as “a diverse set of technological tools and resources used to communicate and to create, disseminate, store and manage information. This broad definition of ICT includes not only technologies such as radio, television, video, DVD, telephone, satellite systems, computer, network, hardware and software, but also equipment and services associated with these technologies, such as videoconferencing and electronic mail. According to (Sarkar, 2012), ICT is “a collection of technological gear and resources used in communication, and generate, distribute, collect and administer information”. These technologies include computers, the Internet, radio, television, smart phones and many other tools for communication. The term ICT “describes the types of technology that are used specifically for communication; it is like information technology but ICT focuses more on technologies that deal with communication, like cell phones, the Internet, and wireless networks, among other things” (Regenesys; in Young, 2012). GESCI (2009) defines the ICT policy in a country as “national ICT policy exploits information and communication technologies to further national economic and social goals”. This definition recognizes that the ICT policy depends on national priorities, the country’s level of development, and the extent of ICT infrastructure, geography and demographics, and the extent of regional integration. According to Zhang (2005), the ICT policy in any individual country’s education system can be found in their national educational plans, reports or formal speeches of ministers of education, spokesmen of political parties or their presidents (See also Alamin, 2015). In this paper, we define the educational ICT policy as a set of decisions, initiatives or plans developed by a country or institution to integrate the ICT in their educational system or to have an individual impact on some or all of those people who are involved in the educational process, i.e., students, teachers, managers, inspectors, families. It is based on a country educational philosophy and ideology to support their political, economic, social and educational reforms.

We argue that there is no clear vision for the educational ICT policy in several developing countries, particularly in Africa. If we have a quick view to the situation in several developing countries, their policy makers are still reluctant to invest in ICT in education, e.g., Sudanese Federal Ministry of General Education recognized that Sudan does not have an integrated vision for ICT in education (FMGE, 2008). There are few formal reports on ICT in education in developing Countries. there is no separated management or department for ICT in education in the ministry headquarters (FMGE, 2014). There are few formal reports on the educational ICT policy, and policies vary from country to country in terms of their levels of specificity (UNESCO, 2013). In published research we can see that some of the reports published by educational sectors which is more professional in nature and others by some related sectors of governments. So, the policies are varying among them according to specificity level of a sector. Hence, the educational ICT policy, particularly in African countries, mainly could be referenced to educational or planning sectors; to the education sector in national cross-sector ICT policy documents and specific ICT documents from the national corporations or internet

service providers (UNESCO, 2013). In this study, we focus on the educational ICT policy, the issues and the needs in the 21st century for policy makers to develop national educational ICT policies.

The present study contributes to the landscapes of the ICT policy and practice in some developing countries by answering the following two questions:

(1) Why do policy makers have to invest in?

(2) What are the core factors in terms of the educational ICT policy assessment from a macro perspective?

This study provides policy makers with dedicated lessons on how they can suggest the educational ICT policy on their national levels as its results show the common factors among the NGOs and formal plans for ICT in education in USA, and UK and China.

2. Methodology

Sources for the present study ‘international experiences of educational technology policies: lessons for developing countries’ are published documents, including: publications by the US Office of Educational Technology, UK Government online archive, BECTA publications, and the website of Chinese Ministry of Education. Table 1 collects major references of the educational ICT policy in selective countries.

The study adopts five standards to select a policy for comparing. First, policies or plans in the selective countries must have been intended to reach and be relevant to a wide audience, with the clear reference to the educational technology. Secondly, policies or plans of the selective countries must focus on the formal K-12 education. Thirdly, policies or plans in the selective countries must offer a perspective on the current and future roles that technology plays in the K-12 education. Fourthly, policies or plans in the selective countries must provide recommendations from or for policymakers a specific set of goals regarding the integration of technology into the K-12 education. Fifthly, while reports may review research literature, provide overviews of current data on technology use or penetration, and/or make recommendations for action by other audiences, these elements must be secondary to a primary goal of advancing a particular vision for improving the role of educational technology in K-12 schools. (Alamin et al, 2015)

This study also considers United Nation Educational and Scientific Cultural Organization UNESCO and World Bank. It also depends on other sources like peer reviewed journal articles, book chapters and published reports related to the area of this study. Juxtaposition have been adopted not only to explain why the policy makers were investing in the educational ICT policy, but also to identify the common factors of the educational ICT policy and practice among these published reports.

We adopt the comparative analysis method based on the juxtaposition approach to analyze and discuss the data, and to establish the differences and similarities between the educational technology policies of the selective countries. Indeed, Juxtaposition is the third step of Bereday’s comparative method in education (Bereday, 1964 in Bray, 2007). Comparative analysis is a kind of qualitative research, it refers to “any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification” (Strauss et. al, 1990; in Bray 2007). However, on the basis of the analysis of the documents and sources collected by this study, we will provide an answer for the two questions of this study, i.e., why have the policy makers in USA, UK and China invested in the educational ICT policies? And what common factors have been shared internationally in terms of educational technology policies?

3. Findings

Due to the high number of reports concerning with educational technology in the selected countries we used the standards in methodology section, These standards were implemented by the USA's department of education in 2003 to assess the educational technology policies in the USA, Indeed the US report implemented these standards in a flexible manner in order to analyze its educational technology current situation in that time, i.e. if the report achieve part of standards then it could also adopt to be as reference for the evaluation. However, the study could develop the below reports which are showing in the Table1. Notable that the first educational technology plan has been promulgated by the USA in 1996 then followed by UK then China, so the historical juxtaposition was suggested based on the USA experience as an Independent variable for the historical juxtaposition. Table1 Below shows the accepted policies based on the present study standards.

Table 1. The core educational ICT policy in USA, UKA and China.

Time of Policy	USA	UK	China
1996-1999	National Educational Technology Plan (NETP1996) Getting America Students Ready for the 21 st Century. Published in June 1996.	National Grid For Learning (NGFL). Published in 1997. National Opportunities Fund (NOF). Published in 1998.	Five-Year Development Program of School Computer Education (1996-2000). Published in 1996.
2000-2004	NETP 2000 Putting A World-class at the Fingertips of all Children. Published in 2000	Towards a Unified e-Learning Strategy -Consultation Document- Department for Education and skills. Published in 2002.	National Tenth Five-Year Plan of Education. Published in 2001. The Tenth Five-Year Plan for Educational Technology. Published in 2002.
2005-2009	NETP2005 Toward A New Golden Age in American Education. Published in 2005.	Harnessing Technology Strategy – Next Generation Learning 2005-2008 (BECTA). Published in 2005.	Eleventh Five-Year Plan for National Education Development. Published in 2007.
2010-2020	NETP2010 The Model of Learning Powered by Technology – Transforming American Education. Published in 2010.	Harnessing Technology Strategy-Next Generation Learning 2008-2014 (BECTA). Published in 2008.	China's ICT in Education Technology 2011-2020. Published in 2012.

Sources. US Department of Education, UK Government & BECTA, and China's Ministry of Education

4. Discussion

4.1. Why have policy makers in the US, UK and China invested in educational ICT policies?

The policy makers in the developed world or in some developing countries were enthusiastic to develop the educational ICT policy on the national levels. They are confident that the development of the educational ICT policy enhances economic, social and educational reforms in their countries (Kozma; 2008, 2011). Challenges like cross cultural borders or political views encourage them to establish and develop specific educational technology policies. However, here are some discussions demonstrating that how the US, UK and China policy makers pay attention to the educational technology policies on their national levels.

The policies of the selected countries showed in findings section (Table1) confirm that economy was a core factor in the early steps of USA's educational technology planning. The first educational technology plan 'Getting American Students Ready for the 21st Century' indicated a great leap of ICT in all aspects of American people. It requires the policy makers in the US to have a new thinking towards ICT in education which guided them to propose the first educational technology plan. They recognized that ICT in education is very important to maintain USA's economy as the first economy in the world in the 21st century, and to cultivate innovative new generations to lead the world in the new millennium in which intense economic competitions are anticipated between all the nations in the world (NETP, 1996). Actually, all the educational technology plans in USA, from the first one which was published in 1996 to the fourth one published in 2010, have stressed the importance of the educational technology policies and their relative impacts on the US economy. The 2010-2020 US plan covered five main areas, among which the productivity of the education sector compared to the private sector was in the core of its discussion. The introduction of the plans to both citizens and congress members shows that "education is the key to America's economic growth and prosperity and to our ability to compete in the global economy" and that "it is the path to good jobs and higher earning power for Americans" (NTEP, 2010). In general, USA have stressed the educational technology as an economy issue among all aspects of their newest plan. The document stressed the need to teach students to search out and sort information, to solve problems, to collaborate, and to participate in social activities. The UK's National Grid for Learning NGFL also referred the educational technology policy to a new labor and the workforce. Table1 second column contains the UK's revised educational technology policies. The policies of UK demonstrate that social issues have a specific attention, while the Harnessing Technology Plans HTPs (2005-2008) and (2008-2014) published by British Educational Communications and Technology Agency (BECTA) were also suggested for all young people in the UK, with clear reference to the preparation of new workforce to support the UK's economy. In the same vein, Chinese Ministry of Education (MOE) emphasized in 1998 that the nation was preparing for the 21st century. Policy makers realized that the knowledge economy, characterized by the extensive use of technology, would dominate social development. Policy makers also realized that a nation's strength and international competitiveness would increasingly depend on its educational, scientific and technological development, and its level of knowledge innovation. It is clear that education needs to be prioritized to be put in a strategic competitive position for the country. Since the ICT had been widely integrated into educational systems to lead the quality-transformation, the lifelong education would be an expected requirement for ongoing educational development and social progress (Xiao, 2010) (NETP; 2000, 2005). The UK government policies stressed the educational technology as a social issue in all its plans from the National Grid for Learning (NGFL) published in 1998 to the newest one Harnessing Technology Plan (HTP). For example, UK's formal educational policy NGFL stressed that ICT in education is a social issue, e.g., "the Internet is a global network that links millions of computers together, it enables over 90 million people worldwide to communicate with one another and makes vast amounts of information available". The UK HTP (2005) also regarded educational technology as an economy issue, indicating that, as building social and community cohesion, technology can bring people with shared interests or concerns together, and provide channels for voicing local needs, tools for maintaining local networks, and ways of building and sharing community learning resources". Some

researchers from UK also stressed that educational technology is an economy issue as a result of their analyses of UK's educational technology policies. For example, Denham and Garnett (2001) argued that the early commitment to the development of technology in schools was consistent with an approach to education which was Schumpeterian in its economic outlook (BECTA; 2002, 2005, 2008). In addition, educational technology is also a political-cultural issue in USA, UK and China. NTEP (2010) stressed that "it is necessary for our democracy to work. It fosters the cross-border, cross-cultural collaboration required to solve the most challenging problems of our time". All USA presidents from 1996 to 2010 have made specific speeches to the educational technologies and they launched several policies supporting technology in education. Chinese scholars acknowledged that Deng Xiaoping, "a president and a politician who led China toward the market economy", played specific roles in the introduction of technology into the educational policies. Educational technology policies in China had been part of the announcements of the Central Committee of the Communist Party of China. On June 13, 1999, the Central Committee of the Communist Party of China and State Council announced an important policy for education development in China, i.e., Decision on Deepening the Educational Reform and Promoting Quality Education, which highlighted the important role that ICT would play in the educational field in a broad educational development context. UK and USA also believe that educational technologies support the quality of education and their educational reforms. For example, more than thirty years ago, *A Nation at Risk* (1983) recommended "computer science" as one of the five main trends to be included in high school graduation requirements. Since then, the US schools have "made dramatic improvements in their technological capacity, driven largely by public and private investments" (USDE, 1983). Michael (2013) debated that since the UK has internationally been at the forefront to introduce computer technology into schools, it has been helpful to provide a brief account of the development of IT, and later ICT in British schools. Information technology industry has been a component of government policy objectives since 1980s, but it is important that the policies are closely related first to business and later to economic prosperity. Policy makers of China also supports a trend of educational technology for quality and educational reforms. A promulgated policy on May 27, 1985 asserted that the fundamental purpose of reforming the educational system was to improve people's quality of life and to cultivate more talented and qualified personnel at all levels to meet the emerging needs of China's economic and social development; indeed, education should be oriented toward modernization, the future, and a greater understanding of the world. Since then, there have been dramatic changes and improvements in various areas of Chinese education, including educational technology (Xiao, 2010). Indeed, all of these issues were mentioned repeatedly in all of the selected countries, and it is obvious that the educational ICT policy has a positive impact on the quality and development of their cultural, social, economic, political, and educational reforms.

4.2. What are the core factors in terms of the educational ICT policy assessment from a macro perspective?

Alamin (2015) developed an ICT policy framework for Sudanese general education and proposed an educational borrowing model based on American, British and Chinese experiences. USA's, UK's and China's educational ICT policies and practices during the period between 1996 and 2012 are compared, revealing the dominant educational ICT policies in these countries, on which basis common factors are summarized, including: institutional mechanism, hardware infrastructure, schools connected to the internet computers, governmental support to connectivity, national networks supporting educational infrastructure, educational digital resources, ICT supported management projects, teachers' professional development and educational technology standards (See NETP: 1996, 2000, 2005, 2010; BECTA: 2002, 2005, 2008; Xiao, 2010).

All NETPs have been repeatedly sharing or mentioning some factors. For example, NETP 1996 stresses teachers training, educational digital resources, and infrastructure; NETP 2000 stressed teachers' and students' technology training and learning, infrastructure, and educational digital resources; the factors stressed in NETP 2005 include leadership in the educational sector and innovative budgeting, while confirming teachers' training, educational digital resources, ICT for management, and ICT infrastructure (Alamin, 2015). ICT policies in both developed and developing countries have shared major factors and these common factors could be used for assessing ICT policies and practices from a macro perspective (Wu et al., 2016). The current situation of ICT policies and practices in China and identified a number of common factors in Chinese educational ICT policies, including: educational ICT infrastructure, educational digital resources, ICT support teaching and management, and supporting systems like institutional mechanisms and financial aids (Chinese Development Educational Technology Plan, 2012). The UNESCO declaration of Qingdao also included these same factors (UNESCO, 2015). The BECTA revised reports (2002, 2005, and 2008) also includes infrastructure, teachers' training, educational digital resources and ICT for management. In 2011, UNESCO reported experiences of Singapore, Namibia, Jordan, Uruguay, and Rwanda. These experiences were reviewed by Kozma's team who assessed the situation of ICT in education in these countries mainly based on three factors, i.e., accessibility to ICT infrastructures, teacher capacity, and monitoring. According to their model, teachers' training and ICT learning environment are regarded as main factors.

World Bank (2012) examines the potential for the use of ICT to support improvement and transformation of the education sector in Africa, including brief case studies of South Africa, Uganda and Senegal. It identifies specific opportunities and challenges, and recommends several areas for government interventions, development partners and other stakeholders, including: teachers' professional development, digital learning resources, affordable technologies, education management information systems (EMIS), and national research and education networks (NRENs). If we regard affordable technologies and NRENs as physical ICT educational infrastructures, then World Bank (2012) also recognized that infrastructure, teacher's professional development, digital resources and ICT for management systems are the major factors in developing the educational ICT. However, all the reviewed literatures share these common factors for assessing the educational ICT policy and practice from a macro perspective. Besides several new factors, the integrated educational ICT policy framework published by the World Bank (2016) confirmed those four factors published by the World Bank in 2012. The factors were shared widely in other frameworks as we have explained. The World Bank (2016) or the SABER-ICT policy framework contains a number of components, including: (1) the vision and planning: having a vision and related policies; (2) a mechanism for funding: authorizing authority to oversee implementation, and engaging the private sector; (3) infrastructure: ensuring adequate power by providing equipment and networking and technical support or maintenance; (4) teachers: providing ICT training for teachers technically and pedagogically, teacher competency standards and support them in their use of ICT classroom over time, raising and building the awareness among them and schools' administrators to support for ICT use by teachers and learners; (5) skills and competencies: ICT in education standards, related to training and assessment; (6) educational digital resources; (7) EMIS: supporting the collection, processing, analysis, and dissemination of education-related data to relevant stakeholders; (8) equity, inclusion and safety; and (9) monitoring and evaluation".

4.3. Implications

Educational policy makers in developing countries are also challenged by certain preconditions when ICT is integrated in their national education system, such as access to ICT tools and well-equipped network infrastructure. It is crucial to change the perceptions and attitudes of both educators and learners towards the integration of ICT in the teaching-learning process and to convince them to accept new technologies. In order to ensure a success in implementing educational ICT policy, it is also important to assess current situations of the educational ICT policy as an essential foundation, the environments and human resources of developing countries are inadequate. The assessment of the current situations in the developing countries is the most important pre-policy step. However, based on policy analysis for each country and institutions of educational a decision on core factors of ICT policies and practices could be then adopted for a national level.

5. Conclusion

Since the first separated educational technology plan has been promulgated by the USA during the mid-1990s, comparable educational technology policies have been developed widely in the developed and developing countries. This study demonstrated that the emergence of educational ICT policies could be considered as a part of socio-economic, cultural-political and educational competition between countries in the world. Moreover, by reviewing the policies of the US, UK and China, as well as reports published by UNESCO and World Bank, this study found some common factors shared by most of these documents, including: (1) policy or vision and authorizing implementation, teachers' professional development, ICT in education infrastructure (digital learning resources, physical hardware infrastructure, internet connectivity in the educational institutions, education management information systems (EMIS) and national research and education networks), and educational technology standards for all of those people who are involved in the educational process.

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