

Advancement of Education Activities in Different Countries

Dr. Joginder Singh Cheema
HOD, Department of Computer Applications,
Baba Budha College, Bir Sahib, Tarntaran

Abstract: This paper describes the national political and economic context in which the policies and programs that support ICT in education Activities. It also provides an overview of the use of national education technology plans in many of the countries reviewed. We focus on three important components of ICT infrastructure that are affecting education: Internet connectivity, hardware and technical support. It also addresses two notable trends to support ICT adoption—the use of cloud computing and the development of interoperability standards.

Keywords: ICT, Digital, LMS, IETE

I. INTRODUCTION

The role of the national government in education ranges from comprehensive in places with strong central powers regarding education. Responsibilities specifically for ICT in education span a similar range of governance structures—structures that are either centrally controlled, locally controlled or a shared responsibility between central and local control. Countries including Chile, Denmark, Estonia, the Netherlands, Singapore and South Korea—and, until recently, England— manage policy and planning for ICT centrally in either a ministerial unit or quasi-governmental organization. Others leave decisions regarding technology largely to local governments (e.g., Canada and Sweden) [1][2][3]. The development of a strategy for ICT use in education is a common undertaking that national or provincial governments use to engage and coordinate multiple stakeholders. These strategies provide a vision for how and why ICTs should be used by educational systems, an analysis of gaps between the current state and the vision and a set of goals consistent with the vision put forward. In many places, these are called national education technology plans or “master plans.” Many countries indicated having had such a plan in the last 10 years.

National goals for ICT in education, in whatever form they are expressed, share many common elements. These goals include: updating infrastructure; ensuring equity of access to digital technologies; improving ICT proficiency among students, teachers and administrators; increasing the availability of digital learning resources; and increasing the integration of ICT into instruction to support students’ creativity and problem-solving and collaborative skills[4][5].

In some cases local, private industry is viewed as a source of both expertise and funding. Estonia and Israel reported receiving funds for operating expenses of a national foundation and third-party funded instructional projects, respectively. Countries identified strategies for supporting software publishers and encouraging a local market for educational technologies by investing start-up funds or seed grants, stimulating demand among teachers and schools, and creating policies that enable private sector activity, such as licensing arrangements and continuity of funding[6][7][8].

II. INFRASTRUCTURE

Access to the Internet and a robust ICT infrastructure form the foundation for any subsequent ICT investments intended to yield long-term benefits. The Internet has transformed how people interact with information and each other through such capabilities as digital online portals, videoconferencing and data streaming. Globally, the number of Internet users has risen steadily in the last decade, from approximately 400 million (roughly 7 users per 100 inhabitants) in 2000 to 1.8 billion (about 27 users per 100 inhabitants) in 2009[9][10].

Given that broad and equitable ICT access figures prominently in numerous participating countries’ national plans for ICT in education, it is not surprising that 19 of 21 respondents consider ICT infrastructure a high priority. Even countries that have achieved earlier infrastructure targets continue to invest in improvements, such as newer and more advanced technology, faster Internet connections and expanded access to populations and areas not previously served[11][12].

Internet Connectivity

Extending learning opportunities beyond traditional classroom boundaries and meeting the needs of underserved populations were both cited by study respondents as goals for improving connection speeds in schools.

Interpreting published connection and transmission speeds of networks can be a misleading indicator of true Internet connectivity without considering the end user’s connection. A user may never experience a network’s advertised speeds, depending on the quality of the “last mile” of the wired network, the quality of a wireless connection and the age of the user’s computer. Further, demand for access can vary by grade level.

ICT Hardware

Providing access to hardware is another priority shared by nearly all participating countries, even though nine countries reported that current levels of hardware access were sufficient. Although computers are the primary focus of policies and programs concerning hardware, eight countries also reported efforts to increase access to other technologies, such as interactive whiteboards and liquid crystal display projectors.

Target Ratios

Participating countries generally track and establish targets for the number of teachers and students who share a given computer or other Internet-enabled device. Target ratios are often used to help governments identify inequalities among schools or regions.

However, the utility of technology ratios as an important indicator of technology integration and the ability to compare published ratios across countries is questionable. Other factors worth considering include the age of the computers, whether they are in working order, the presence and quality of Internet connections, the presence of appropriate software, the presence of appropriate peripherals (such as printers, scanners, or projectors), and location in the school.

One-to-One Computing

countries are pursuing one-to-one computer ratios for either teachers or students or both One-to-one initiatives focus on laptops or less expensive netbooks, and can include tablet computers or mobile smartphones as well.

Mobile Devices

Affordability and the existing widespread penetration of mobile devices, including student-owned devices, are fueling countries' interest in netbooks, tablets and smartphones as tools for teaching and learning.

ICT Technical Training and Support

Consider providing improved technical support a priority, not all support this need with programs. Countries provided national funding for hardware purchases but relied on schools to fund their own technical support services.

Other ICT Trends

Cloud Computing

[13][14] Cloud computing is an Internet-based computing architecture for centralized processing, storage and services for a large number of networked computers. Cloud computing is being implemented to reduce local hardware and maintenance costs, improve cyber security and facilitate access to software resources.

Interoperability Standards

Interoperability standards can help existing digital resources be more seamlessly integrated and allow new digital resources to be designed with compatibility in mind. Although this study's survey did not address interoperability standards specifically, representatives of several participating countries discussed them in the follow-up interviews. Study data do not support an exact count of how many countries already have interoperability standards in place and where they are being developed.

III. APPROACHES TO DEVELOPING STUDENTS' ICT SKILLS

[15][16] Despite the prevalence among participating countries of ICT standards embedded across the curriculum, some countries did report teaching computer science as a separate subject. In England, for instance, students ages 5–15 take ICT courses as part of their regular studies. ICT is also a separate subject for vocational high school students in several places. Respondents for Estonia and Finland, where students have long been assumed to be proficient and ICT has not been taught as a separate subject, spoke of wanting to reestablish ICT courses. These respondents found that although students are indeed already proficient in certain applications and online tasks, their skills do not entirely overlap with those desired for school and employment.

Digital Learning Resources

Digital learning resources encompass a wide range of teaching and learning tools. This study adopts a definition of digital learning resources that includes: collections of materials stored in online repositories or catalogs; digital textbooks; online tutoring and other supports for individualized anytime-anywhere learning; and videoconferencing applications that are often used for foreign-language learning or collaboration with students in other schools. Digital learning resources can be distributed or accessed online or locally, in formats such as DVDs or CD-ROMs.

Digital Textbooks

A pilot is now underway at the primary level. The digital textbooks are all loaded onto a tablet-style device, such as an iPad. The textbooks, which are open resources, are offered through a Linux-based platform. (LMSs in South Korea are also open and Linux based.)

As described above, partnerships between Ministries and publishers make possible the development of high-quality digital learning resources in many places; this is true for digital textbooks in France, where a small pilot program is also underway at the middle school level. The Ministry of Education has purchased a 4-year license to the digital textbooks' contents, an investment it views as parallel to its usual investments in paper textbooks. In France, the digital textbooks are stored in schools' LMSs.

Online Learning, Videoconferencing, and Serious Games

Online learning, videoconference applications and online educational games (also called serious games) are three modes of delivering instruction via the Internet. Online courses function as substitutes for face-to-face courses in remote or underserved areas that may not have a large enough school population or sufficient funds to provide the same range of language instruction or advanced courses available to students in more populated or privileged areas.

Learning Management Systems

[17] A Learning Management System (LMS) is an online environment used to organize and manage courses, both in terms of administrative tasks and content. LMSs are being used to track student attendance and progress, post and share content, and communicate through features such as wikis, blogs and discussion forums (Trotter 2008). Individual teachers typically organize materials into course-specific sites within the system. Students and teachers log in for restricted access to relevant materials. Teachers have access to additional functions, such as the ability to post assignments or announcements and to maintain an e-grade book. Depending on how the platform is configured, students may have individual pages or storage space and collaboration across courses may be possible. Depending on the functionalities of the system and the goals of stakeholders, access can also be granted to administrators or parents. Blackboard, a commercial product and Moodle, an open-source platform, are commonly used LMSs. School Information Systems (SISs), which typically house a range of data on students, teachers and other school staff members and infrastructure and resources available at a given school, are not generally linked to LMSs, although some LMSs have some SIS-like features built in.

Uses of ICT for Individualized Learning and Special Needs

Online tutoring can provide struggling students supplementary help in an individualized way by tracking their responses and focusing on the areas where they need the most support. Online resources can not only help students catch up, but also provide them with experiences they would not encounter in the regular school day and regular curriculum. ICT also has great potential for students with disabilities, providing tailored supports for students with mental disabilities and new opportunities to participate in class for physically disabled students (e.g., text-to-voice programs or a digital bell to signify raising one's hand to give an answer). The IETE study did not identify many uses of ICT to support special-needs students. Possibly efforts are already underway but not at the national level or not by the national government.

IV. ICT- SUPPORT EFFORTS TO BUILD TEACHER CAPACITY

Technology skills per se (e.g., basic hands-on computer tasks and how to operate basic office software) have long been a focus of ICT-related teacher professional development in many places around the world. Definitions of and standards for teacher technology competency have expanded over time to include use of ICTs to support innovative teaching and learning practices, especially to support student-centered pedagogy and a renewed focus on students' skills in critical thinking, communication and collaboration[18].

As was the case with student ICT standards, the use of the term “standards” was problematic for some countries that may not have identified licensing requirements or recommended guidelines related to ICT as “standards.” In this report, ICT standards for teachers are defined as a framework or set of guidelines that describes desired teacher outcomes or competencies with regard to ICT, whether or not those competencies are assessed and whether or not they are mandatory or recommended.

An emerging trend among participating countries is a move to interactive, collaborative models of material development and sharing including communities of practice. The concept of communities of practice permeates the field of education. Any group of people who share an interest or profession can either evolve a community of practice informally or institutionally establish one with the goal of encouraging collaborative solving of complex problems and to encourage continuity of practice.

Many countries reported that using ICTs to deliver teacher professional development (through formal or informal instructional activities) is a priority. The two most commonly reported specific priorities were (1) supporting teachers’ integration of ICTs into instruction and (2) improving teachers’ pedagogical skills[19][20].

V. ICT- SUPPORTED CONTINUOUS IMPROVEMENT EFFORTS

National policies and programs related to the use of technology to support administrative systems for accountability, evaluation and continuous improvement are described. Information is presented on how national education systems are using technology to monitor and track school, teacher and student performance to help policy makers and administrators identify where new policies and programs may be needed and where current policies and programs are on track or in need of improvement[21] [22].

Also discussed is the extent to which countries are collecting national data on ICT in education indicators, including measures of access, use and impacts of ICT within their own educational systems. Finally, countries’ efforts to evaluate their own internal ICT in education policies and initiatives are described. Information was collected on the designs and methodologies being used, including data collection instrumentation (e.g., administrative records, surveys of administrators and teachers).

VI. CONCLUSION

Even in the midst of global economic crisis, countries participating in the IETE study reported that they are continuing to invest in ICT strategies to improve their educational systems. They indicated investments in ICT infrastructure to improve equity of access to high-speed Internet connections and to increase opportunities for all schools to leverage the capabilities of high-bandwidth instructional tools in the classroom involving both video and audio and unlimited users. Countries also reported investing in computer hardware, increasingly portable and mobile, to improve access to the Internet and instructional software for teachers and students. In addition to investments in ICT infrastructure, computers and learning management systems, countries also reported investing in one of their most important resources—teachers. Almost half of the countries reported providing online professional development for improving teacher skills and providing interactive collaborative tools to foster the development and sharing of instructional materials and strategies among teachers. Almost all of these countries also reported providing digital instructional resources for teachers through websites, online portals and learning management systems, often partnering with commercial publishers for their development. These continued investments in ICT have sparked international interest in the collection of indicators of ICT in education for the purpose of policy and program monitoring and national benchmarking. Investments in ICT to improve education are a global priority. The common goal should be to improve understanding of how best to implement ICT in education and of how best to support teachers and students in acquiring the skills necessary to teach and learn with technology.

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