



Professional Development: Preparing School Administrators for a Digital Age and Students for Success

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1. Introduction

Because of schools around the world are embracing online learning as a prominent feature on university campuses (Lederman and Jaschik, 2013), education must be prepared for this influx of technologically driven students. Online learning is engaging the student in reflective and collaborative thought processes through learner-to-learner interaction results in the most effective learning (Cox and Cox, 2008: 553). Cox and Cox added that online learning can open the doors to communication powerful tool to educate today's population of scholars because they are already submersed in it through social media, texting, and the Internet.

To support the need for increased professional development for instructors of online courses, a study reported that 70 percent of faculty members describe their institution's support for online instruction as average or below and nearly 20 per cent of all institutions do not offer any support, more than one-third of faculty members who have developed or taught an online course report that developing and teaching online courses takes much more work than traditional courses (Herman, 2012: 88). Among the types of training that Herman advocates for are

those provided through professional development from academic leaders and training tied to evaluation programs. Therefore, attention needs to be turned to the academic leaders such as coordinators, directors, and deans of distance learning.

Furthermore, Lane (2013) explains that online course training requires a different set of skills from academic leaders and appropriate professional development programs should be in place. This is a leadership gap because programs should be established by the administrators to ensure all avenues of learning are addressed. As the enforcers of the university's strategic plan, academic leaders should be held accountable for training the staff to teach growing numbers of online courses. Students' experiences in online learning are a direct result of the instruction they receive. However, instructors can only educate students based on the knowledge and training they receive. Furthermore, academic leaders should employ strategies to bridge the gap between the instructor and the online learning platform.

2. The Importance of Training and Professional Development

After recruiting and selecting new personnel,

the next step is training and development. Training typically refers to teaching lower-level or technical employees how to perform their present jobs. Development refers to teaching administrators and professionals the skills needed for both present and future positions. That is, administrators need to help all personnel to fulfill their potential by learning new skills and developing their abilities to the fullest.

Training and professional development goals are to transform teaching into profession of choice. Why training and professional development is needed to improve teacher quality?

International research shows that teacher quality is the most significant school-based factor in determining student outcomes.

The quality of a system cannot exceed the quality of its teachers.

While there are certainly many excellent teachers in the Malaysian education system, a 2011 research study found that only 50% of lessons are being delivered in an effective manner.

3. Professional Development for Administrators

With all the attention being paid to teachers' professional development, it is no surprise that administrators' needs have been neglected over the years. Since most administrators receive their knowledge, training, and skills on the job, with occasional university course or vendor provided by the district, it becomes evident that a greater initiative needs to be taken to prepare administrators for 21st century educational institutions.

For administrators, the internet can be a place to provide information and resources that were not available in the past. International Society for Technology in Education (ISTE) Standards (formerly the National Education Technology Standards (NETS)) for Administrators

are the standards for evaluating the skills and knowledge school administrators and leaders need to support digital age learning, implement technology and transform the education landscape. Transforming schools into digital age places of learning requires leadership from people who can accept new challenges and embrace new opportunities. Now more than ever, the success of technology integration depends on leaders who can implement systemic reform in our schools.

What principals and district administrators need to know about technology integration? Technology has forever altered the way we learn and teach, and the pace of change is only accelerating. How can educational leaders keep up with the daily onslaught of information when new literacies rapidly outpace traditional literacies, and access to technology and information expands exponentially? Administrators and teacher leaders have to take personal responsibility for understanding changes in technology implementation and integration in their buildings and classrooms rather than simply relying on technology support staff. It is up to the building-level staff, district personnel, and educational leaders to move schools into the digital age. Individual districts vary in how technological they are (or think they are), so any action plan needs multiple levels of experience and usage. The following list provides a springboard for conversations as school leaders seek to assess the status and logistics for progress toward 21st century classrooms.

Larson, Miller, and Ribble [7] suggest considerations align with ISTE's NETS for administrators (www.iste.org/nets) for initiating a shared vision that embeds technology integration into all aspects of teaching and learning. Furthermore, the ISTE has drafted a set of five technology standards for school administrators that can guide the redesign

and/or development of new graduate courses and training experiences. The ISTE standards to help prepare administrators and their schools for the 21st century are:

3.1 Visionary Leadership

Educational administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization. It is easier to move forward when everyone stops moving sideways. Districts should strive to create and implement a shared vision that integrates technology into all aspects of teaching and learning. Without a specific plan for technology, districts remain awash in an ocean of ideas, losing valuable time while staff members unsystematically organize themselves. All school leaders (administrators, teacher leader, and instructional technology staff) need ownership in the vision to keep technology plan moving in the right direction.

As technology becomes more user friendly and accessible, technology leadership becomes increasingly complex. Students and teachers may believe that they can use technology in the same ways they do at home, without an understanding of the larger educational system and complications. But the larger the district, the more multifaceted the technology plan becomes, as leaders identify existing assets and needs while providing the resources for staff.

As there is often a just-in-time need for resources, administrators must provide quick direction for their teachers. They can do this much more efficiently if the district has adopted a proactive technology plan before such urgent needs arise. In fact, a proactive vision is crucial for lasting and

effective technology integration.

3.2 Digital-Age Learning Culture

Educational administrators create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, and engaging education for all students. Concepts of teaching and learning have changed drastically over the past decade. Teachers are no longer the sole providers of knowledge because information is easily accessible on the Internet. As a result, all those connected to teaching and learning must first renew their vision to establish digital learning environments. Teachers need to be able to connect to their students' digital worlds to engage and motivate a new and very different type of learner. As persuasively expressed by Mortimer Zuckerman, editor in chief of US News e-World Report reported that the classroom teachers would play the role of enhancers, answering questions and helping students better understand the material covered electronically.

For many teachers, adding one more thing to a curriculum that is already full may seem virtually impossible, especially when the focus is on high-stakes testing of core areas such as reading and math. Consequently, it is vital that administrators, teachers and technology leaders focus on the same collaborative vision of sound technology integration across core curricula. To further support a digital learning culture, educational leaders must critically assess how much technology students have access to and how often they assess it. As online state assessments demand more computer use, students have little time and fewer resources left for creative and innovative use of school computers. School leaders must ask themselves questions such as:

- It is OK to block off significant amounts of

time for test preparation at the expense of time to use digital tools? Or

- How can a new, shared vision help us rethink what a typical classroom should look like?

3.3 Excellence in Professional Practice

Educational administrators promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources. Professional growth opportunities that match the vision are essential to the implementation process. Only through ongoing, consistent, leveled professional development opportunities can users gain the technology skills and confidence needed to teach the new literacies. Larger districts may have instructional technology staff to provide needed support but smaller districts need to find alternative methods to fill this gap. Early adopters can establish a teaching cadre to assist in district-wide training.

Additional options for staff development include bringing in experts from the outside or using online and prepackaged training services. These opportunities cannot be one-time programs. They must offer ongoing, consistent support for educators. Some include:

- Start users at one skill level and then allow them to move through subsequent levels in a tiered program to acquire more knowledge with technology while documenting their training outcomes and products. These programs may also provide a way for users with advanced skills to test out.
- Provide incentives for those who complete training cycles (e.g., if you take a session on digital photography, you receive a digital camera to use in your classroom).

- Use blogs, wikis or course management systems, such as Moodle, to create and share courses or information with teachers.
- Provide time during the school day to have teachers work with the technology in their classrooms.
- Encourage teachers to collaborate for training and/or implementation.
- Create a core group of trainers to teach others.
- Encourage attendance at regional technology conferences.
- Provide information about free online resources.

The opportunities are endless. It is up to the creativity of the leaders to find the best solutions to move their districts forward while working collaboratively with all stakeholders. In moving forward, it is important to promote technology use not as playing with gadgets, but as accessing tools to make educators and learning more effective at motivating, engaging, and preparing students for their futures.

3.4 Systemic Improvement

Educational administrators provide digital-age leadership and management to continuously improve the organization through the effective use of information and technology resources. Leaders at all level must take a systems perspective on technology and predict the long-term complications of decisions. To keep on track, school leaders at all levels need to look within their schools to identify gaps in their technology needs related to the shared vision. Reaction plans should reflect current realities but also continue to move forward, toward the long-term goal. If technology is a priority for the district, are leaders evaluating how

and if students and teachers are using technology in classroom? If leaders are going to expend resources on tools, leaders need to have some guarantee that people are going to use them efficiently. Simultaneously, leaders should align policies and procedures related to technology with the district's overall vision.

Not all technology staffs are equal. Some districts are fortunate to have lead technology people who understand both technology and curriculum. Instructional technology staff, administrators and teachers need to be able to communicate with each other about needs and perspectives. Teachers should communicate with instructional technology staff about their needs; instructional technology staff must understand those needs to support teachers in the classroom; and administrators need to be able to talk with, listen to, and act on requests from instructional technology staff and teachers. To continue improving the organization through effective and creative use of technology resources, leaders must provide digital age leadership.

3.5 Digital Citizenship

Educational administrators model and facilitate understanding of social, ethical, and legal issue and responsibilities related to an evolving digital culture. One area of consideration that administrators often overlook is the appropriate use of technology within districts. They ask users to sign and support acceptable use policies (AUPs) but often do not make it clear what they mean or how to use technology appropriately.

Throughout the three sets of NETS, ISTE identifies that all users in a district should understand the social, ethical and legal issues and responsibilities as related to technology. To accomplish this, it is the obligation of all educational leaders to lead by example.

Multiple resources help to provide a framework for these issues. For example, the ISTE book *Digital Citizenship in Schools* by Gerald Bailey and Mike Ribble identifies nine themes for users to break down digital citizenship into respective components and provides resources for educational leaders to begin setting up plans and programs within their districts.

All leaders need a springboard to open the discussion with their facilities and staff about appropriate technology use. Educators can then provide that information to their students, as everyone needs to work together to identify and understand the appropriate and effective use of technology in education.

4. Why Administrative Professional Development is Important

Effective leadership is one of the most critical aspects of school and district success. However, a NCREL study found that 70 percent of principals feel 'somewhat' or 'completely' unprepared to be instructional leaders. Just as teachers need training to become their best, school and district-level administrators greatly benefit from professional development designed specifically for them.

4.1 School Leaders: Guiding Teachers into the Digital Age

We all know that leadership is important in education. Without strong leadership, education initiatives tend to crash and burn. Leadership is one of Learning Forward's seven Standards for Professional Learning – evidence-based standards that outline the characteristics of professional learning that lead to effective teaching practices and improved student learning.

This standard holds that leaders develop their own and others' capacity to learn and lead professional

learning, advocate for it, provide support systems, and distribute leadership and responsibility for its effectiveness and results.

A recent evaluation of an on-demand computer-based professional learning application found that when a school's staff was highly engaged with the application, student achievement – measured by performance on standardized assessments, dropout rates and a goal of college attendance – improved at a much higher rate than at schools where the staff was less engaged. Interestingly but unsurprisingly, the schools that showed higher engagement, and thus greater improvement, had something else in common, that is what the researcher termed as 'leadership, implementation and accountability.'

As we move deeper and deeper into the information age, more and more professional learning will occur digitally, and that professional learning will be more and more dedicated to digital learning for students. If a school leader is unable to create a digital culture, his or her school will struggle. While individual educators can develop the skills necessary to help students succeed in the new economy, if that capacity does not spread throughout the school, and if the school lacks the tools needed for teachers to effectively instruct in the digital world, ultimately, students will suffer.

5. A Model to Develop School Leaders as Technology Master

Scott Klososky in his keynote speech at NASSP's 2013 Ignite Conference, focused on how school leaders can support digital learning. He pointed out that educational leaders today are transitional leaders. They are responsible both for managing people and for managing the transition to teaching and learning in a different way, preparing

students to go into a very different world. And they have to develop a strategy with which technology will be implemented in their school, taking a long-term view on a subject that is constantly changing.

Klososky believes that school leaders need to become 'technology masters'. He offered a model for how to get there.

5.1 Develop three to five technology guideposts for the school

These are goals to work towards – for example, 'We want to deliver 35 per cent of instruction online'. These goals should take two to three years to accomplish.

5.2 Create an adaptive culture

Ensure that those in the school understand that things are constantly changing – and changing quickly. Educators must get new technologies to students quickly, understanding that there will be many failures and that they should not fear mistakes.

5.3 Develop a good technology team

This team includes vendors, IT staff, contractors, and others who are responsible for the day-to-day management and troubleshooting of technology. According to Klososky, too often leaders do not work hard enough to ensure they have an excellent team to make things run smoothly, so they experience problems that demoralize staff and hinder progress.

5.4 Develop processes around technology

Without processes, leaders can find themselves haphazardly choosing vendors and products and only sporadically training teachers, for example. Clear processes around these issues and others both increase efficiency and ensure that all aspects of a school's technology tie to the ultimate vision of the school.

● Differentiate between 'digital learning' and 'digital plumbing'

Digital learning is how we use technology

tools. Digital plumbing is technology infrastructure. Prioritize both, but clearly distinguish between them in developing a technology plan.

- **Consider measurements**

Without being able to measure the impact of a technology tool, a leader cannot be sure it is an effective use of time and other resources.

6. Digital Age Leadership

Technology has added a new level of responsibility for school leaders. Many consider themselves unprepared or unqualified to identify and integrate technology in their own practice. It is important to move past any reservations and discomforts to prepare students for the futures they deserve. Now is the time for educational leaders to focus the conversation on how technology fits within their classrooms to best meet their students' needs. If we want our children to be competitive on a global level in the 21st century, we need to be visibly using and talking about these tools for teaching and learning. The future is already here, and we have to welcome the opportunities it brings to reshape instruction.

7. Student Perceptions on Digital Age Learning Culture

Reilly, Gallagher-Lepak, and Killion (2012) analyze the student perceptions of digital age learning as related to creating a sense of community among those in the course. The students took classes and completed coursework primarily online through a controlled platform provided and the teacher acted as the facilitator. The research study attempted to figure out what students needed in order to be successful in their study and what teachers needed to do in order to provide students with such an environment in terms of course design and implementation.

The results of the study proved that when the curriculum embeds, creates, and fosters community, the learning environment improves. The students were more inclined to engage with, not only the coursework but their peers during online assignments. Though some of the students preferred the sense of being alone and being able to work independently, most of them wanted to know their voice mattered.

On the other hand, Zimmerman [12] sees students as being self-regulated learners. He insists that learners need to communicate with their peers often and ask peers for help as well how often they helped others. They found that the instructional role acquired by the students mimicked the traditional role that students have in social networking platforms when they communicate with their peers, which means instructors need to be educated on the nuances of social networking platforms in order to incorporate those into their digital age learning environment.

Overall students were not negative about the idea of using technology but rather about its implementation and application in the coursework. [1]; [5]; [11] and [12] all point towards the idea that even though most students take online courses because they prefer to work independently, they always want clear and detailed instructions on every assignment. In addition, instructors understand that regardless of how technology is used, different students will respond in different ways.

8. Current Trends

According to Marc Prensky [10], 1.5 billion students have access to cell phones and other devices. It is an advocate for appreciating the power of having a computer in a student's pocket to assist in everyday learning experiences and make a strong statement when Prensky explains how cell phones

are not just communications devices or new ways of communicating between people, they are actually computers in the students pockets and are always with them. His belief is that by prohibiting students from using the devices, educators cut their students off from the full potential of their learning experience.

Borup et al.[2] examined how even though students have a variety of learning styles, being able to see their instructor, even though virtually, is a technique that crosses various learning styles because it is more about the person-to-person experience and being able to connect to a person and not just an email address. The fact that [12] tied social networking into their study on online learners is a sound 21st century move and surely lends itself to further exploration and would be an extension to the [5] and [2] studies to see how the different disciplines can most effectively use social networking in online learning.

9. Future of Digital Age Learning Culture

Today's students are in two categories like digital natives and techno newbies. They are either too far removed from 9/11 or they are digital natives and have grown up with a fast-paced and ever changing world. The latter have created their own worlds of technology and do not see a connection to traditional classroom and college campuses. Educators need to understand the expectations and habits of these students, who want an online experience, and find ways to meet them where they are. Social norms, physical disabilities and economic barriers continue to change and evolve, and students do not need the structure and guidance that the four walls of college used to provide, but they need a new system for a new student, which instructors must understand. Students read more emails and status-updates than school related material and bring their laptop to class to occupy their time.

10. ICT for Malaysian Education

The Ministry will ensure that students not only learn how to use ICT but are able to leverage it effectively to enhance their learning. The Ministry will deliver this by strengthening the foundation of ICT-enabled schools while introducing proven ICT solutions into the education system. Measures undertaken will include:

- Providing students with the skills and knowledge to learn effectively and live productively in an increasingly global and digital world.

- Equipping all 10,000 national schools with 4G Internet access and a virtual learning platform that can be used by teachers, students, and parents through the 1BestariNet program.

Training all teachers to embed ICT in teaching and learning in order to support student learning.

- Increasing the number of ICT devices until the student-devices ratio reaches 10:1. The ratio may be lowered further subject to an impact assessment and availability of funds.

- Piloting ICT innovations for delivery such as distance-learning and self-paced learning before scaling up nationwide.

Malaysia has long recognized the transformative potential of ICT in education. The UNESCO review noted that Malaysia was among the first few countries in the world to have pioneered a strategic ICT plan for its education system. The review also noted an 'impressive array' of policies and plans developed since 1990, including the Smart School Roadmap and the Policy on ICT in Education 2010. The goal is to harness the potential of ICT to enhance the depth and improve the overall quality of education. The intent is more ambitious than simply teaching students to be able to employ basic ICT functions such as using word processors, the Internet and email. ICT in education should also help students

to foster higher order thinking skills.

The Ministry also seeks to leverage ICT to improve the efficient delivery of quality education to under-served groups such as rural and under-enrolled schools. Accordingly, one of the most capital-intensive investments the Ministry has made in the past two decades has been in the ICT infrastructure for schools. From 1999 to 2010, the Ministry has invested approximately RM6 billion on ICT in education initiatives. The bulk of these funds went towards additional computer labs to support Teaching and Learning Science and Math in English Program (RM2.6 billion) and the building of a computer lab in every school (RM2.5 billion). A study conducted by the Ministry in 2010 found that ICT usage was relatively limited. Approximately 80% of teachers spend less than one hour a week using ICT. Only one third of students perceive their teachers to be using ICT regularly. Further, the UNESCO review noted that “even when ICT is used in teaching, in most cases it has not gone much beyond the use of PowerPoint as an instructional tool. There is no evidence that ICT is being used to foster students’ creativity, problem solving, and critical thinking and communication skills.”

One reason usage still appears to be limited is that hardware was rolled out without sufficient training and support services to schools, such as technicians to maintain the equipment. Even in cases where training and support were provided, it was often not continuous or sustainable. As such, teachers were ill-prepared in terms of how to actually use the computers in their day-to-day work. This finding is in line with international research that suggests that high-end facilities, like computer laboratories, smart classrooms and science laboratories only become useful once teachers and students alike know how

to use the technology and equipment in meaningful ways within learning processes. Another issue is the lack of a long-term strategy for sustaining and scaling up key policy implementation elements, such as ICT infrastructure and teacher competencies. For example, there is no explicit guaranteed period of computer renewal, such that schools that received equipment in the early 2000s are now in dire need of renewal. In line with the earlier findings on resource productivity, these investments have not been consistently linked to a clear set of expected student outcomes, and have not been rigorously monitored to determine impact.

11. The Roadmap: Leveraging ICT for Learning

The Ministry continues to aim for all schools to officially qualify as ‘Smart Schools’ (that is, to achieve minimum standards of ICT utilization, capability, availability of infrastructure and applications) while integrating ICT into the teaching and learning process. Drawing on the current research on the impact and potential of ICT in education, the Ministry will adopt the following principles to guide the development of its ICT strategy.

11.1 Ensuring the fundamentals are in place

In line with successful examples of rolling out a strong ICT program in education, the Ministry will adopt a sequenced approach to ICT Critical elements for ICT usage such as devices, network and applications, ICT competencies in teachers, and curriculum and assessment must be in place prior to shifting to more intense, innovative usage of ICT.

11.2 Building on Established Foundations

The Ministry will ensure that successive initiatives build on earlier programs. For example, the Ministry will ensure that all future ICT initiatives enhance and strengthen the effectiveness of 1BestariNet. This is to maximize the Ministry’ return on investment in

this program and to ensure that 1BestariNet becomes the catalyst for ICT innovation in education in Malaysia.

11.3 Investing in ICT Solutions for Groups with Specific Needs

Despite the uncertainties highlighted in international research, current ICT solutions can still be utilized to enable cost-efficient access to high-quality teaching and learning resources to groups with specific needs such as rural schools, under-enrolled schools, and gifted students.

11.4 Relying on Outcome-based Assessments

Evidence-based assessment should form the basis for evaluating significant potential investments in ICT. This will require improving the existing set of measurement tools such as the Smart School Qualification Standards (SSQS), particularly as international standards are established.

Employing these principles will require first ensuring a strong foundation in ICT. Once these foundations are in place, the Ministry will consider opportunities for delivering more innovative ICT-based solutions, supported to clear evidence of positive impact.

12. Wave 1 (2013-2015): Enhancing the Foundation

In Wave 1, the Ministry will build upon the existing base to ensure that basic ICT infrastructure and competencies are in place throughout the system while avoiding commitments to any specific technological platform. The main priorities include:

- Ensuring students and teachers have sufficient access to ICT devices;
- Providing the education system with a learning platform and sufficient network bandwidth to use ICT services; and
- Ensuring that all teachers have basic

competency in ICT.

Additional priorities during this period include refining existing monitoring systems to provide more accurate assessments of progress in ICT initiatives, infusing ICT into the curriculum and providing quality, cost-effective content.

12.1 Providing Network Infrastructure and a Learning Platform through 1BestariNet

1BestariNet is a project initiated by the Ministry. Under this project, 10,000 primary and secondary public schools in Malaysia will be equipped with 4G Internet access and a virtual learning environment (VLE) by the end of 2013. The high speed internet connectivity and access to a world-class Integrated Learning Solution that 1BestariNet will be the catalyst for the inculcation of ICT in the Ministry's day to day operations, and could position Malaysia to move to the forefront of ICT innovation in education. The Ministry will ensure that all teachers are trained and competent in the use of the VLE by 2015.

What is 4G?

4G, an acronym for fourth-generation wireless, is a type of technology that can be used with cellular phones, wireless computers, and other mobile devices. This technology gives users faster access to the Internet than most previous third-generation (3G) networks can offer, and it also offers new user options such as the ability to access high-definition (HD) video, high-quality voice, and high-data-rate wireless channels via mobile devices. Common standards for 4G are still in the process of being defined by the International Telecommunications Union (ITU), governments, industry, and other stakeholders, but currently includes a minimum download speed of 2 megabits per second (Mbps).

12.2 Delivering more ICT Devices

The Ministry will focus on delivering more ICT

devices that are not necessarily computers (such as tablets or smartphones as digital devices continue to converge) to students and teachers. In order to remain cost-efficient, the Ministry will innovate along several dimensions.

Firstly, it will investigate acquiring fit-for-purpose devices. The Ministry has already made good progress in this area, for instance, through its use of thin-client computer (low-end computer terminals with limited functionality while relying on servers to provide computing power in order to reduce costs). It will also experiment with utilizing new, less resource-intensive alternatives for ICT facilities compared to current computer labs, such as a lending library for notebooks and computers-on-wheels. This will become increasingly important as ICT becomes more mobile and the entire school becomes the computer lab.

In addition to assets and physical infrastructure, the Ministry will review the current procurement process to address existing concerns regarding the maintenance and the lifecycle cost of ICT devices, as well as the replacement policy of existing inventory of ICT devices. It will also consider new innovations in procurement such as direct-sourcing from manufacturers, rental agreements and private partnerships to drive down costs.

The target is to achieve a minimum ratio of one computer for every ten students. This will provide students with sufficient computers to be able to learn how to use ICT as well as take advantage of innovations to support broader learning.

12.3 Ensuring that all Teachers and Ministry Officials are ICT Literate

The Ministry will enhance its existing set of training programs to ensure that all teachers meet a minimum level of ICT literacy by the end of 2015. The system's standard for ICT literacy is based on an

established rubric for ICT competency developed by ISTE. All teacher trainees will be required to meet these competency standards as part of their pre-service training. Current teachers will be required to pass an online diagnostic test by 2014. Those who do not pass the test will be required to complete a series of online training modules and re-sit the test by the end of 2015. The process of testing and training will be supported by a professional development platform run on 1BestaruNet's VLE. ICT standards for teachers and related training modules will be continuously updated as ICT evolves over time.

Other Ministry personnel will also be continuously trained in ICT to ensure that they are equipped to achieve their tasks efficiently and effectively. This includes proficiency in more specialized financial and other management applications to support resource management.

12.4 Shifting towards More User-created Content

Given the planned rollout of the 1BestariNet system, the Ministry will transfer existing ICT services such as EduWebTV to the VLE as a single, integrated platform for hosting these services. The Ministry will also explore creating original content as well as adapting pre-existing content to support student learning. The Ministry will also support more user-created content such as the e-Guru video library and will establish a process for managing user-generated content.

12.5 Integrating Data Management for Schools and Ministry

The Ministry will integrate and reconcile its various database and management information systems. These databases will be hosted on 1BestariNet to enable access across all Ministry offices and schools for critical tasks such as data entry and processing.

13. Wave 2 (2015 to 2020): Introducing ICT Innovations

As the foundations for ICT are strengthened in the Malaysian education system, the Ministry will study additional opportunities to transform ICT usage in the classroom such as through EduWebTV. This includes scaling up best practices from areas of excellence and innovation identified in Wave 1. The Ministry will also update its strategy to reflect new findings from international research on how to leverage ICT in developing higher order thinking skills.

13.1 Exploring ICT Solutions for Specific Groups, Reviewing Best Practices for the System

It is important to distinguish between system-wide interventions – to be embedded in every classroom and every school – and niche interventions for specific target audiences. During this period, the Ministry will focus on introducing and piloting niche programs for groups with specific needs such as under-enrolled and rural schools, and gifted students. This could, for instance, include virtual delivery of lessons and online adaptive learning tools as an enhancement activity to classroom learning. The Ministry will also investigate options for employing ICT solutions to improve parental and community engagement in education.

As an international consensus forms around best practices for use of ICT to develop higher-order thinking skills, the Ministry will also conduct a detailed review to establish the path forward for ICT in education policy. The review will be conducted employing an outcome-based assessment of potential options.

13.2 Achieving a Critical Mass in ICT Devices

Achieving a critical mass in number of ICT devices in the education system will be essential as more ICT-related innovations are introduced into the system. As a continuation of the Wave 1 initiative, the Ministry

will lower student-to-computer ratios to a maximum 10:1. A review of other countries indicates that most of the highest-performing systems have achieved a ratio of at most 10:1.

14. Wave 3 (2021-2025): Maintaining Innovative, System-wide Usage

In Wave 3, ICT should be fully embedded throughout the pedagogy and curriculum of the education system. The Ministry will focus on scaling up and intensifying ICT usage among students and teachers. This will bring the device to student ratio in line with leading countries such as South Korea. The Ministry will also continue to expand efforts around distance and self-paced learning.

15. Defining ICT Literacy for Teachers

ISTE is a global association that advocates excellence in teaching and learning through innovative and effective use of ICT. Representing over 100,000 educators worldwide, ISTE has established a set of internationally-recognized benchmarks to help measure competence for the integration of ICT in education, known as the National Education Technology Standards (NETS). NETS require all classroom teachers to meet the following standards:

15.1 Facilitate and Inspire Student Learning and Creativity

Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.

15.2 Design and Develop Digital Age Learning Experiences and Assessments

Teachers design, develop and evaluate authentic learning experiences and assessment,

incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes to utilize ICT.

15.3 Model Digital Age Work and Learning

Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society, including fluency in ICT systems and digital tools to support student success and innovation.

15.4 Promote and Model Digital Citizenship and Responsibility

Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.

15.5 Engage in Professional Growth and Leadership

Teachers continuously improve their professional practice and model lifelong learning.

16. International Research and Best Practices: ICT in Education

A key concern of policy-makers when considering investments in ICT equipment and software is whether student use of ICT will improve learning of traditional school subjects. Empirical studies to date show an inconsistent relationship between computer availability or use of ICT and student learning. As noted by UNESCO in its 2011 report *Transforming Education: The Power of ICT Policies*, “Some studies show a positive relationship between computer use and achievement, some show negative relationships, and some show none.” The connection between ICT and student learning is more complicated than one based on mere availability or use – what matter is how ICT is used and what is tested.

16.1 Link Between Selective ICT Use and Student Learning

Kulik's 2003 analysis of the results of 75 students, “The Effects of Using Instructional Technology in Elementary and Secondary Schools: What Controlled Evaluation Studies say,” found that selective use of ICT can have a positive impact on student learning. For example, students who used computer tutorials in mathematics, natural science, and social science scored higher on tests in these subjects. Primary school students who used tutorial software in reading also scored significantly higher on reading scores.

16.2 Transformation Impact of ICT on Education Remain Unclear

In addition to traditional school results, the emergence of a knowledge-based economy has accelerated the need of higher-order thinking skills such as creative thinking and problem solving to find innovative solutions to an ever-changing set of problems. Creative and innovative applications of ICT are seen as important potential tools to transform the educational process so as to support the development of these higher-order thinking skills.

However, an evidence base remains limited. UNESCO reports that “there are few studies that go beyond traditional measures of student learning to include outcomes such as creativity, complex problem solving, collaboration, and the ability to learn, and even fewer that do this in the context of developing countries.”

Similarly, a range of pedagogical approaches have been recommended as the most effective ways to engage learners in developing this skill set. These approaches include student-centered learning, active learning, project-based learning, and inquiry-based learning. While the integration of ICT into the learning process holds much potential to support these objectives, the World Bank notes that “there is still much unknown about the ‘best’ or most effective approach for utilization of ICT to meet

these objectives.”

Much of the difficulty lies in the lack of clear metrics for measuring the impact of ICT on higher-order thinking skills. For example, it is difficult to measure improvements in student creativity and then definitively identify ICT as the cause of the improvement. Organizations such as the EU are in the process of developing a number of metrics, such as the ICT 4E system, although these have yet to gain widespread use.

Nevertheless, the promise and potential of ICT in revolutionising education remain undeniable. The growth in the number, sophistication, and use of ICT devices in society provides a strong basis for making schools more productive and efficient – transforming teaching and learning into an engaging and active process.

16.3 Implementation Should Be Phased and Holistic

Amidst these uncertainties in objectives and best practices, it should not be surprising that many countries fail to fully meet their educational objectives. The World Bank reports that “one of the enduring difficulties of technology use in education is that most programs did not take a holistic approach to ICT, failing to link the educational goal of expanded ICT use to necessary associated reforms of the curriculum, student assessment system, pedagogical approaches in the classroom, and teacher training.”

For example, in 2007, Peru distributed more than 800,000 low-cost laptops under the One Laptop Per Child (OLPC) initiative at a cost of USD200 million in an effort to leverage digital technology in the fight against poverty. However, five years later, assessment indicated that teachers were ill-prepared to use the computers to enhance teaching. Many teachers were not ICT literate themselves, software bugs

needed to be rectified, and some schools did not have access to electricity.

In contrast, the most successful implementations of ICT in education such as Singapore and Jordan have adopted a more phased, gradual approach. Critical to this has been ensuring that all elements are incorporated into the transformation process: hardware, software, content, teacher training, pedagogy, and performance management systems.

17. Conclusion

Regarding the role and use of ICTs in education, the Malaysian experience, one of the ‘early starters’ in this area, can provide important lessons. First, it appears that educational system with a long term strategy and progressive targets in key policy implementation areas play a key role in moving to an ICT-enabled knowledge society. Such strategies ensure that their schools are provided with updated ICT infrastructure and their teachers are trained to use ICTs not only as an instructional tool but also to foster student creativity, problem-solving, critical thinking and communication skills. Secondly, from an organizational point of view, it seems to be in the interest of educational systems to position ICTs as an essential enabling factor for all education reform initiatives and to consider them as just as important as curriculum or assessment reforms. Given the huge potential and impact that ICTs can offer to shift the century-old paradigm in pedagogy and assessment, disconnection between curriculum and ICTs must be avoided. Moreover, the M-EPR reveals the important of motivating and facilitating schools and teachers to undertake ICT-enhanced pedagogical and assessment innovations. This comes automatically along with the need to establish monitoring, feedback and supportive mechanisms to help teachers and schools to meet strategic targets indicated in the policy

and action plans. Finally, the M-EPR shows also the benefits of devising a discursive channel that can encourage dialogues between policy makers and ground-level implementers, including teachers, students, parents, community and private enterprises. Without such mechanisms, efforts to integrate ICTs in education and opportunities to exploit its potential can be jeopardized.

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