The Promise of Technology Integration in Schools

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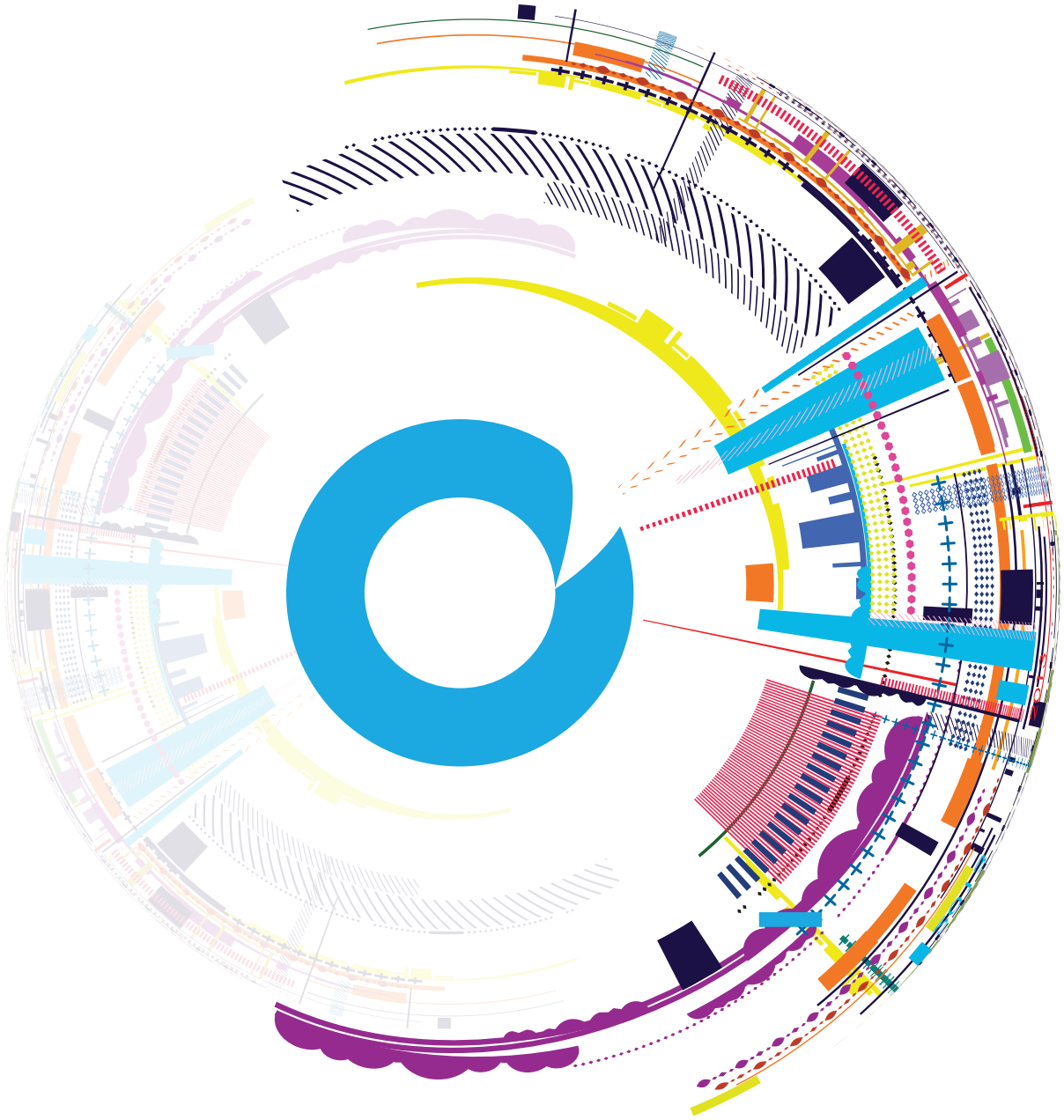

The Education Partners
TRANSFORMING LEARNING

GMS EDUCATION

About the Authors

Denise Gallucci, a visionary strategist, innovator and committed education executive, is the Chief Executive Officer of GEMS Education Americas and The Education Partners.

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Foreword

Little Boxes: The Promise and Power of Successful Integration of Technology into Education

By **Justine Cassell, Ph.D.**
Associate Dean of Technology Strategy and Impact
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Perhaps 2-3 years ago, I was invited to speak to the Minister of Education and his officials from a mid-sized country coming out of an economic crisis and in the midst of a major overhaul of the national school system. I spoke about the role technology can play in improving education. However, I cautioned, technology is not a panacea for all ills, it is imbued with no magical powers and, in fact, just like any ICT it is a medium and not a message. What matters, I told them, is the nature of the learning experience the computer allows and not the humming box or its clicking keyboard. I emphasized particularly the importance of safeguarding the social bonds between student and teacher, and among peers. I pointed out that software and hardware in and of themselves do nothing without a pedagogical vision. I showed them examples of immersive learning environments that are engaging, and that provide real-time feedback to students, and real-time assessment for teachers, but that need a teacher to drive the message home.

The audience was enthusiastic. Many nods, many smiles, meaningful glances among the ministry personnel, much taking of notes. At the end of my talk there was, however, only one question, “So, shall we buy laptops or tablets for our schools?” I laughed, but they were entirely serious. I reiterated that hardware holds no magic, but the audience would not budge. They wanted an answer to what seemed to them to be the most important question.

The report you are about to read describes the effects of beliefs such as these down the line. If computers in and of themselves are thought to be the vehicles of educational improvement, then sufficient resources will not be put aside for capacity building among teachers, for hardware support, and for the development of a pedagogical vision that brings together digital technology with great teaching. In the absence of this vision, is it any surprise that teachers end up disappointed, and ultimately resistant to the presence of technology in their classrooms?

With a rare awareness of the negative cycle that can ensue from simply dropping off computers in a classroom, The Education Partners is committed to capacity building among teachers, leadership development among school administrators and support for culturally-sensitive, technology-enhanced education vision-building with ministries of education and other national educational groups. For, even though the hardware holds no magic, the conjunction of a passionate and informed teacher with technology that motivates students, adapts to their needs, provides real-time feedback and embedded assessment, is unparalleled in lifting up school systems to meet the needs of all learners – particularly those at greatest risk of falling behind. It is The Education Partner's goal to ensure that school systems invest in this kind of technology, for this kind of successful integration of technology into the classroom can change a school system, a school and most importantly, lives. It can improve the opportunities available to teachers and their students for generations to come.

Introduction

By **Denise Gallucci**, CEO of The Education Partners and GEMS Education Americas

The landscape of education has radically changed over the last decade: new innovations, new inventions and new opportunities. Societies around the world have witnessed the emergence of the smartphone, personal computers, tablets, the internet, Windows, Google and Facebook. The opportunity now exists for technology to disrupt education in ways that can close the opportunity gap for millions of students around the world.

Technology has the power to transform how people learn. New technology employed in innovative ways may hold the golden key to unlocking challenges to educational access and equity. Yet, were you to walk into some classrooms, you could be forgiven for thinking you were entering a bygone era in teaching and learning. In the United States, 28% of classrooms do not utilize technology and 69% of U.S. teachers continue to use traditional whole class instruction as their primary mode of instruction. Only half of U.S. educators (52%) think that ICT technologies are effective or very effective at diagnosing the needs of students. Further, 29% of teachers say their schools do not have adequate hardware devices for student use, 22% suggest that their school does not have adequate facilities to use technology and 16% share that they find ICT usage inconvenient or logistically challenging.

We know that we can build and harness the technology needed to close these gaps. The lesson is clear that classroom innovation remains stagnant despite the rapid transformation of digital technology. We need to create a new vision for educational technology in schools.

This paper provides data and an analysis of ICT access, addresses barriers to implementation and integration in the education system and offers practical solutions to address these challenges. It emphasizes the need for education technologies based on what we know about the process of learning. It concentrates on a strategic approach to focused change and asks, what can we do to get from where we are to where we need to be?

If our children are to excel in an evolving knowledge society, we must harness the technology resources they need to function in a digital age. It is no longer about providing *every child with one laptop*. It is about personalizing learning and enhancing skills that have not historically been in the teacher toolbox. For innovations in education to be realized, schools and school systems must be redesigned in ways that foster student growth by offering highly personalized learning ecologies.

Hitting Restart: Realizing Technological Breakthroughs in Schools Around the World

Promising the Brightest Future: The Possibility of Technology Integration in Schools

The pen was mightier than the sword. Now, it is the keyboard that is mightier. Ideas that will change the world are now authored on digital devices of all sizes; consumed on desktop monitors, tablets or mobile phones; and printed for distribution using digital technologies—or shared via blogs, Facebook posts or Tumblr. The information we share is the commodity of choice in our emergent global knowledge economy.

ICT (information and communications technology) systems refer primarily to digital technologies, including the computing platforms that power devices such as laptops, tablets and smartphones. In our definition of ICT, we consider both hardware, as described above, as well as software, which includes broad categories of collaboration environments, game-based learning tools and virtual reality simulations.

How ICT systems transform national economies and societies is self-evident. ICT integration drives national economic growth rates while boosting growth efficiency. The proliferation of ICT also explains the contemporary evolution of the workplace. Emerging technologies and innovations in business practices shift employment towards high-skilled jobs that require the creation of ICT technologies, while technology replaces some low-skilled workers altogether. Internet commerce, for example, is replacing brick-and-mortar storefronts, reducing the percentage of retail employment consisting of in-store cashiers (Bureau of Labor Statistics, 2013).

The potential impact of ICT on education seems limitless. In formal learning environments, educators who embrace ICT can create more engaging curricula further capable of being adapted and personalized for individual learner needs. Teachers can deliver more aesthetically engaging lessons and connect with diverse learners across vast distances. Through the use of targeted data analytics, educators can assess learner growth in more accurate and nuanced ways, and harness learner data as the medium in which they reconstruct future curricula and instruction to meet the needs of all learners, particularly those at the greatest risk of falling behind.

The impact of ICT on how students learn outside of school may prove even more profound than in-school uses. Many young learners, even in otherwise technology-poor environments, have access to a mobile phone, providing robust opportunities to accelerate their own learning through informal means. Furthermore, constant connectivity to limitless information provides the capacity for learners of all ages to self-direct their own educational futures. Content-rich websites and massive open online courses (MOOCs) may allow those from all over the globe to engage in lifelong learning alongside other individuals with similar interests.

Australia's ICT Policy

By **Susan Mann**, CEO of Education Services, Australia

The Australian government's ICT policies over the past 20 years have centred on infrastructure, learning resources, teacher capability and leadership. The federal *Digital Education Revolution* policy (2008-13) expended AU $2.1 billion on hardware, software, networks and learning spaces, resulting in high levels of school access to ICTs, improved learning experiences for many students, access to digital curriculum resources and increased exposure of teachers to innovative ICT use.

The recent introduction of cloud services and a reduction in personal device costs, and their rapid uptake, have resulted in the growth of "bring your own device" (BYOD) environments in schools. This trend has coincided with a shift from "top-down" government policy in relation to ICT practice in the classroom to innovation increasingly being driven by experiences at the school level gained from learning and teaching, and shared though communities of practice.

Mapping Technology Penetration in Schools Worldwide: Two Emergent Narratives

Student interaction with ICT technologies has already begun to transform classrooms around the globe (Figure 1). One widely-accepted indicator of ICT penetration in school systems around the world is the number of students per computer in schools. Data gathered during the 2012 Organization for Economic Co-operation and Development Programme for International Student Assessment (OECD PISA) administration revealed that 72% of students in OECD countries reported using computers in schools (OECD, 2015). Additionally, school systems in 45 nations and municipalities worldwide have at least one computer for every five students, while 11 nations report having more than one computer per class (5 to 10 students per computer) and eight school systems have at minimum one computer per school (14 to 53 students per computer). At first glance, these figures should encourage optimism for school systems around the world to realize the promise of transforming classrooms through ICT integration.

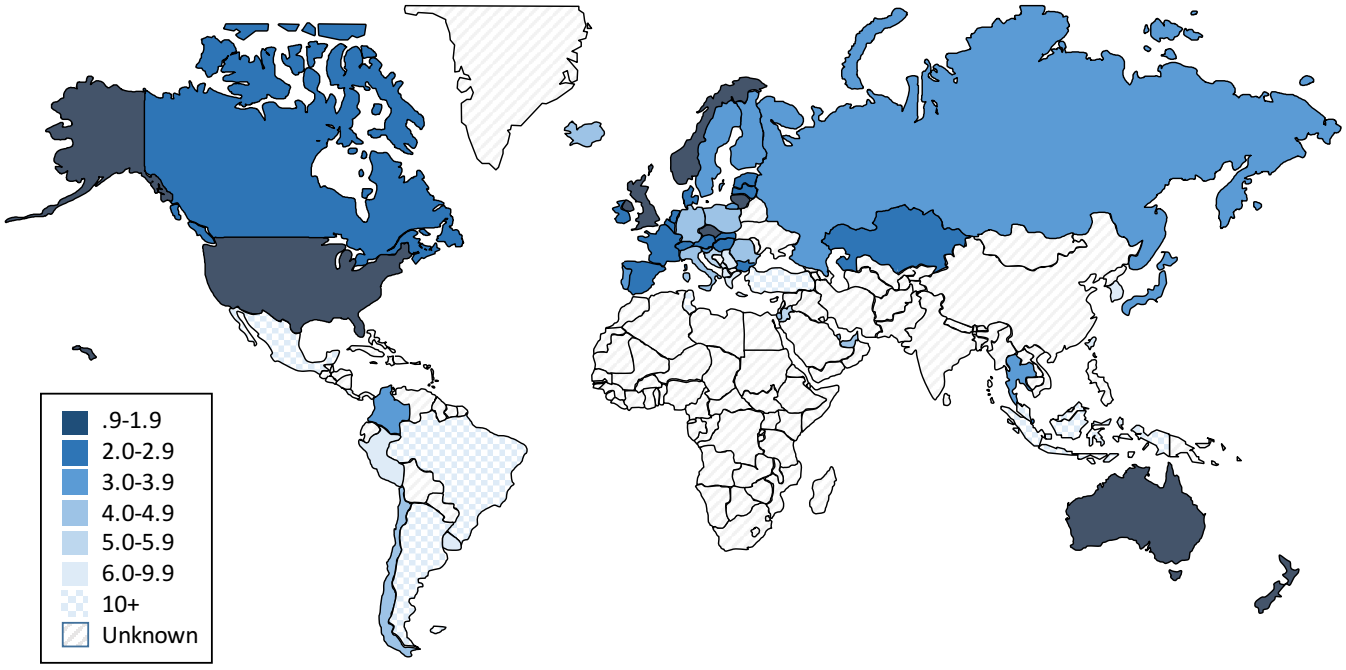

Figure 1. Number of students per school computer (OECD, 2015)

Yet mapping ICT ubiquity in schools surfaces two narratives running counter to this initial optimism. First, there appears to be a clear inequitable distribution of ICT penetration in school systems located in North America, Europe and East Asia versus those located elsewhere, in particular on the African continent. It should come as little surprise that nations such as Singapore have higher levels of resource availability per student to spur robust ICT implementation in schools than nations located in Sub-Saharan Africa, despite shared positive dispositions to ICT integration. More surprising is a lack of expected correlation between student outcomes and ICT penetration within school systems that have low ratios of computer access in classrooms. For example, schools in South Korea and Israel have approximately the same number of students per computer (5.3 and 4.7, respectively), yet South Korea maintained national rankings of 3rd and 2nd in math and science, while Israel ranked 38th overall in both subjects on the 2012 PISA. Lower student-to-computer ratios did not translate directly into increased PISA results. For instance, the United States ranked 33rd in math and 25th in science on the 2012 PISA, despite ranking 6th in the world for student-to-computer ratio (1.8 students to each computer).

This reality seems to run counter to the narrative of promise, that the integration of technology in schools has limitless potential to transform both national economies and personal identities. Therefore, what explains the disconnect between the present and the promise of ICT integration in K-12 school systems around the world?

Addressing Barriers to Technology Implementation in Schools: What We Know

Fortunately, explanations have been offered for why integration of ICT into classrooms in national systems of education does not always correlate to success in test scores or rankings. The four predominant obstacles to positive benefits of ICT integration in classrooms include: educator attitudes and beliefs, school resources, teacher ICT knowledge and skills and institutional factors.

Educator Attitudes and Beliefs. Twenty-eight percent of U.S. teachers from a representative sample choose not to integrate any technology into their classroom, suggesting that many educators might not believe that ICT integration is essential to help student achievement (Gates Foundation, 2015). This determination is not without warrant: a recent report (2015) released by the OECD asserted that school technology has raised too many false hopes as national investment in school computers and classroom technology does not correlate with improvements in pupils' performance on the PISA examination.

Too Many Devices and Not Enough Learning

By **Maciej Jakubowski**, former Deputy Minister at the Ministry of National Education in Poland

It is important to recognize areas where computers might be useful and understand that in some areas, they might not be able to replace or even enhance traditional resources. Computers and the internet might increase productivity in education just as they did in our offices. Schools are already using computers to find information, create documents, connect to parents, and so on. Obviously, computers can increase efficiency in these standard tasks. However, when it comes to learning and teaching, it seems much harder to use computers to improve quality. While sometimes the use of ICT might increase student motivation, it will not magically turn uninterested students into hard workers. To the contrary, computers might be as distractive or ineffective in some cases as they are helpful in others.

The OECD report found that investment in school computers and classroom technology may actually be linked with lower PISA results. However, these educators' beliefs on how ICT affects student achievement represent just some of many perceptions that can impact the integration of ICT technology into classrooms. Educators' individual attitudes towards personal technology use and confidence levels in their own personal abilities to use technology also influence whether or not they choose to integrate ICT technology into their classrooms.

Resources. Resource scarcity represents far more than a lack of hardware and software tools available for educator use (Hew & Brush, 2007; Ertmer & Ottenbreit-Leftwich, 2013). Hardware may break down regularly, and many school systems provide minimal technical support to fix technology in the event of these inevitable difficulties. Additionally, many countries around the world do not have access to robust software packages available in regional languages that enable access by either educators or students. Other issues concerning resource scarcity include inadequate curriculum resources that integrate ICT, insufficient planning time for integrating ICT into instruction, inconsistency of high-speed internet access and unpredictable electrical blackouts.

ICT Knowledge and Skills. Baseline teacher and student proficiency with technology can also affect the integration of ICT into classrooms around the world (Hew & Brush, 2007; Ertmer & Ottenbreit-Leftwich, 2013). For many educators, ICT skills and ICT curriculum integration do not represent components of their required formal education or certification processes. Furthermore, teachers across multiple national contexts have asserted that they have few professional development opportunities to grow their ICT pedagogical skills once in the classroom. For students, lack of resources at home including family ownership of a computer, internet access and mobile technologies may also hinder their ability to interact effectively with similar technologies in a classroom setting.

Institutional Factors. National, local and school-level policies and norms can exert tremendous influence over ICT integration into individual classrooms (Hew & Brush, 2007; Anderson & Dexter, 2005). Comprehensive national and local visions, plans, education policies and educational funding decisions can serve to push ICT integration forward across schools. Conversely, unrealistic expectations, poor planning and lack of sufficient funding can hinder ICT integration into classrooms. Furthermore, national norms concerning education such as dedication to lifelong learning may also impact whether or not students and teachers utilize ICT to promote the self-direction of their own learning experiences. At the school level, leader dispositions towards technology, intra-staff trust, a commitment to teachers' continued education and leadership and ICT curriculum-building exercises can all drive effective ICT use forward at the school level.

Overcoming Obstacles and Finding Opportunities: Three Cases from Across the Globe

How schools and school systems around the globe address these four barriers (educator attitudes and beliefs, school resources, ICT knowledge and skills and institutional factors) and other more locally-relevant barriers affects the capacity of classrooms to integrate ICT in meaningful ways for learners. Examples from three different national systems—Cambodia, Ghana and Chile—highlight the degrees to which educators and learners operating in diverse national and cultural contexts address these barriers to classroom ICT integration.

CAMBODIA

Context. Cambodia is a Southeast Asian nation with approximately 15 million citizens (half under the age of 22) and an average GDP of USD $1,000. The Cambodian Education System was decimated by Khmer Rouge rule (1975-79) 40 years ago due to the regime's objection to formal education and its targeting of literate professionals for eradication during their reign.

ICT Integration Successes. Cambodia has made substantive strides towards classroom ICT integration despite significant resource limitations. Teacher and student belief in the importance of ICT and its impacts on economic and personal development, coupled with a coherent Master Plan for ICT integration developed by the Ministry of Education and the NGO Education Partnership (NEP), assist Cambodian classrooms in the realization of higher levels of effective ICT integration in schools. In addition to this promotion of NGO-governmental partnerships, an increase in the number of ICT training courses for teachers, higher levels of hardware and technical support and enhanced access to Khmer-accessible software help bolster Cambodia's educational ICT infrastructure (Dionys, 2012).

Continuing ICT Integration Challenges. Cambodia still faces tremendous challenges in realizing robust ICT integration implementation in its classrooms (Richardson et al., 2014). Despite advances in resource availability, the lack of functioning computers and internet resources in the Khmer language (the national language of Cambodia), the inconsistency of internet access and sporadic electricity outages continue to challenge Cambodian educators in their movement towards schools with higher levels of effective educational ICT integration.

CHILE

Context. Chile is a South American nation with 17.6 million citizens and an average household income of approximately USD $16,000. Moreover, 3.8 million students are enrolled in 26,000 schools nationwide. Chilean students ranked 49th and 45th on the 2012 PISA Mathematics and Reading Scores, respectively (OECD, 2013).

ICT Integration Successes. Chile has multiple pathways through which it has achieved higher levels of ICT integration into classrooms. First, a robust national policy pushing for ICT integration into classrooms has been spearheaded by the Ministry of Education, including a national center of education and technology (ENLACES). High levels of ICT integration financing have followed these policy changes in order to ensure effective implementation in classrooms around the country. Coupled with supportive policy and financing, the Chilean Ministry of Education has taken substantial steps in providing data-driven educator training to realize the national ICT integration agenda (Hinostroza & Brun, 2012). Finally, a robust level of scholarship from Chilean education researchers provides a mechanism to hold the national ICT vision accountable to outcomes.

Continuing Integration Challenges. A major overarching challenge to ICT implementation in Chilean classrooms is that ICT does not play a central role in the economy. In other words, the dearth of a Chilean ICT industry complicates the vision that ICT integration in schools aims to realize. Educators also cite a lack of adequate hardware and software as a continuing obstacle to classroom ICT integration. However, the use of interpersonal computers, or students using shared monitors to complete individual learning tasks, has shown some promise for schools strapped for resources (Nussbaum et al., 2015). Moreover, teachers have expressed the need for adequate time to plan lessons and curricula that integrate ICT in meaningful ways for students (Jaramillo & Chavez, 2015).

GHANA

Context. Ghana is a Sub-Saharan African nation with 26 million citizens and a GDP of USD $1,900. As of 2012-13, Ghana enrolls approximately 7.2 million students in its 52,000 schools nationwide. The OECD projects that the national GDP of Ghana will double to USD $3,881 if all 15-year-olds achieve a basic level of eduction, the highest increase of any nation in the world.

ICT Integration Successes. Ghana has had a number of successes in ICT integration. Most importantly, Ghanaian teachers and students hold positive perceptions of the potential for ICT to improve student achievement (Agyei & Voogt, 2011). Schools also have higher levels of access to hardware and software than countries with similar GDPs. For example, most Ghanaian schools have computer labs with access to learning software. Ghana authored and implemented robust institutional policies and norms in both 2008 and 2015, outlining its robust vision for ICT integration into schools (Ghana Ministry of Education, 2009). The visibility and consistency over time of these policies demonstrate a commitment to ICT for learning gains that may help teachers and school administrators commit to the use of these technologies in the classroom context.

Continuing ICT Integration Challenges. Despite seemingly high levels of hardware and software in Ghanaian schools, government reports suggest that fewer than 6 in 10 (57%) school computers are fully functional and 93% of software used in schools is unlicensed (Ghana Ministry of Education, 2009). These facts limit the capacity of students to access ICT in the classroom while placing schools at legal risk. Scholarly research has also confirmed that few students are able to use these resources for enhanced learning opportunities. Other resource scarcity challenges identified by Ghanaian educators include teacher time allotted to plan ICT lessons and an erratic national power grid that experiences unexpected outages. Regarding training, many teachers express the need not just for visible policies but also for further professional development opportunities to ensure better ICT integration into their schools (Agyei, 2013).

Summary

Coherent patterns begin to emerge when analyzing the successes and challenges of school systems in diverse national contexts. The four predominant barriers to ICT implementation in schools include: educator attitudes and beliefs, institutional factors, resources and ICT knowledge and skills. Teachers and students in diverse educational systems express a desire to have rich experiences engaging with ICT in classroom settings, and this suggests that educator beliefs may act as a facilitator rather than a barrier to ICT classroom implementation. Similarly, institutional policy and vision setting may serve to support rather than hinder ICT implementation as ministries of education around the world articulate an eagerness to make ICT a central part of formal education at the primary and secondary levels. However, a lack of access to resources coupled with a dearth of relevant ICT professional development for educators still appear to present significant barriers preventing many educational systems from adequately integrating ICT tools into classrooms and curricula. In conclusion, the desires of many education ministries to integrate technology into classrooms may currently outweigh actual organizational capacity.

Restarting Technology Integration in Schools Around the World: Action Steps

How can national ministries of education, policymakers, school leaders and teachers choose to act to integrate ICT effectively into K-12 classrooms? A more coherent vision of necessary action emerges through the identification of both the grander economic and social promise of ICT coupled with challenges in ICT implementation in classrooms around the world (Figure 2).

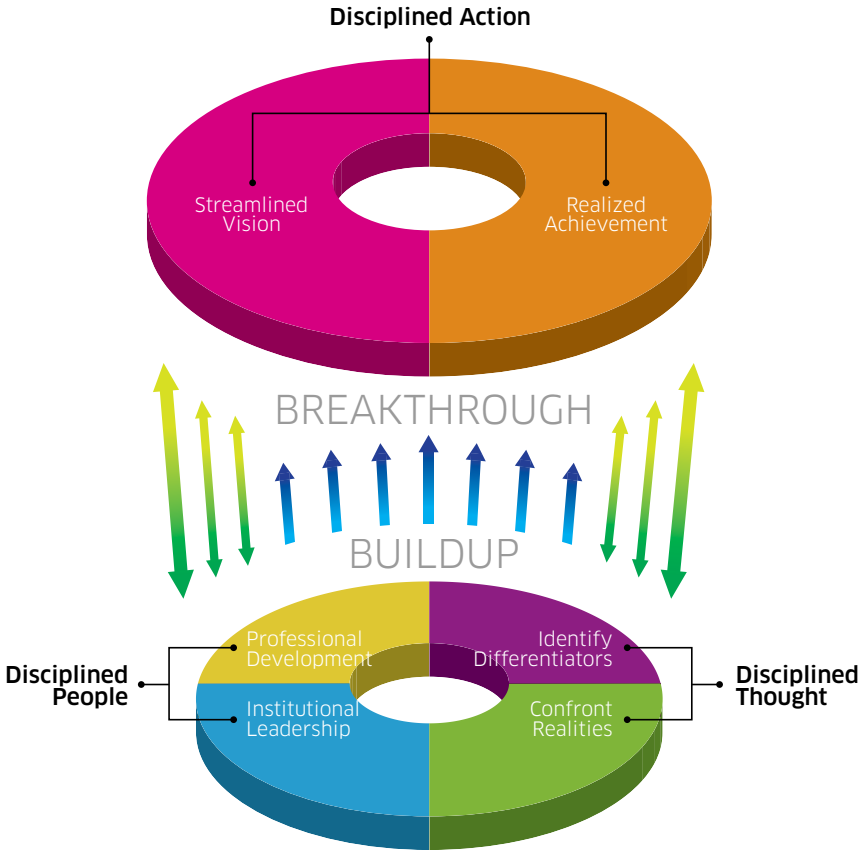

Figure 2. Model for national ICT integration (Adapted from Collins, 2001)

The Education Partners knows that ICT integration in many schools around the world is stuck in a flywheel holding pattern, where the wheel of transformation is churning slowly, but the buildup has not yet generated the necessary momentum to propel a breakthrough in innovation for both teaching and learning. To achieve this disciplined action, The Education Partners recommends that systems around the world embrace the following four-step approach.

Institutional Leadership

Both policymakers and school leaders need to co-develop coherent and realistic, as well as ambitious, ICT integration plans for educational innovation at the national, local and school levels. This may require external consultation about models that will help ICT integration succeed, given national and local contexts.

Professional Development

National schools of education and local education agencies need to ensure that school leaders and teachers have the training and skills, both technical and pedagogical, required to integrate ICT successfully into curriculum and instruction. This step is critical, as we know that simply introducing additional hardware into classrooms will not succeed if educators are not trained to use these tools effectively.

Confronting Realities

Policymakers, local education agencies, school leaders and teachers need to consistently and honestly evaluate the balance between ambition and respect for reality. Particular attention must be paid to finances, limitations on educator planning time and technical support requirements.

Identifying Differentiators

By confronting ICT realities, policymakers, local education agencies, school leaders and teachers can begin to identify and leverage differentiators, or unique characteristics of the local context, in order to build effective ICT systems for both students and educators.

The Education Partners stands by our assessment that implementing this approach with fidelity will result in a clear vision of ICT integration, realized student achievement and more coherent institutional policies and norms for educational systems around the world. It is with this disciplined action that school systems will be able to harness ICT integration in ways that allow for the realization of transformational breakthroughs in student achievement.

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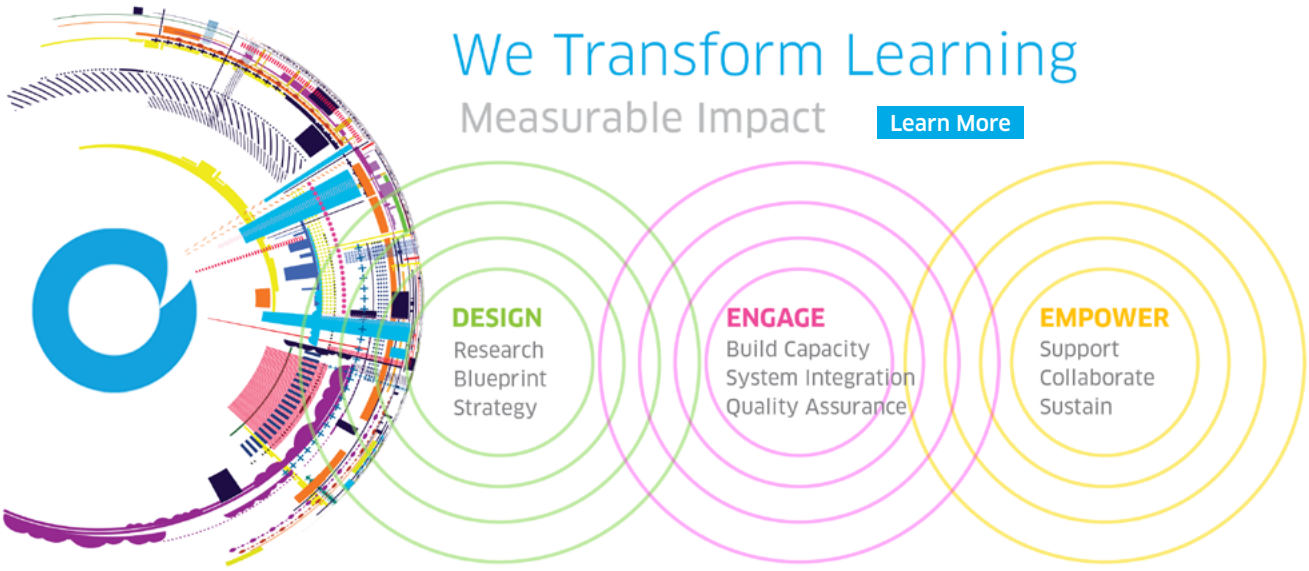
About The Education Partners

The Education Partners is the specialist consultancy division of GEMS Education, and its services are built on the educational heritage that GEMS has been developing for nearly 60 years. The Education Partners works with public and private clients to transform the quality of global education and skills provision.

The Education Partners uses its expertise and insight to deliver leadership and management solutions, school improvement, skills partnership and education reform. Its work is focused on making a tangible difference in the lives of learners, communities and nations, enabling students of all ages to be prepared to succeed in an increasingly competitive world.

The Education Partners serves a range of clients including education ministries, state departments of education, cultural institutions, for profit and nonprofit organizations and corporate entities along the Pre-K through age 20+ learning continuum to improve social and economic outcomes for individuals, communities and nations.



About GEMS Education

For over 55 years, GEMS Education has approached its educational offering from a unique perspective. Our first school was founded in 1969 by educators and is still run by educators. It was this school that defined our approach to education – an approach built around listening to the community and tailoring our schools to meet the community's needs. We now have schools globally educating over 250,000 students, from 173 nationalities, across 19 countries.

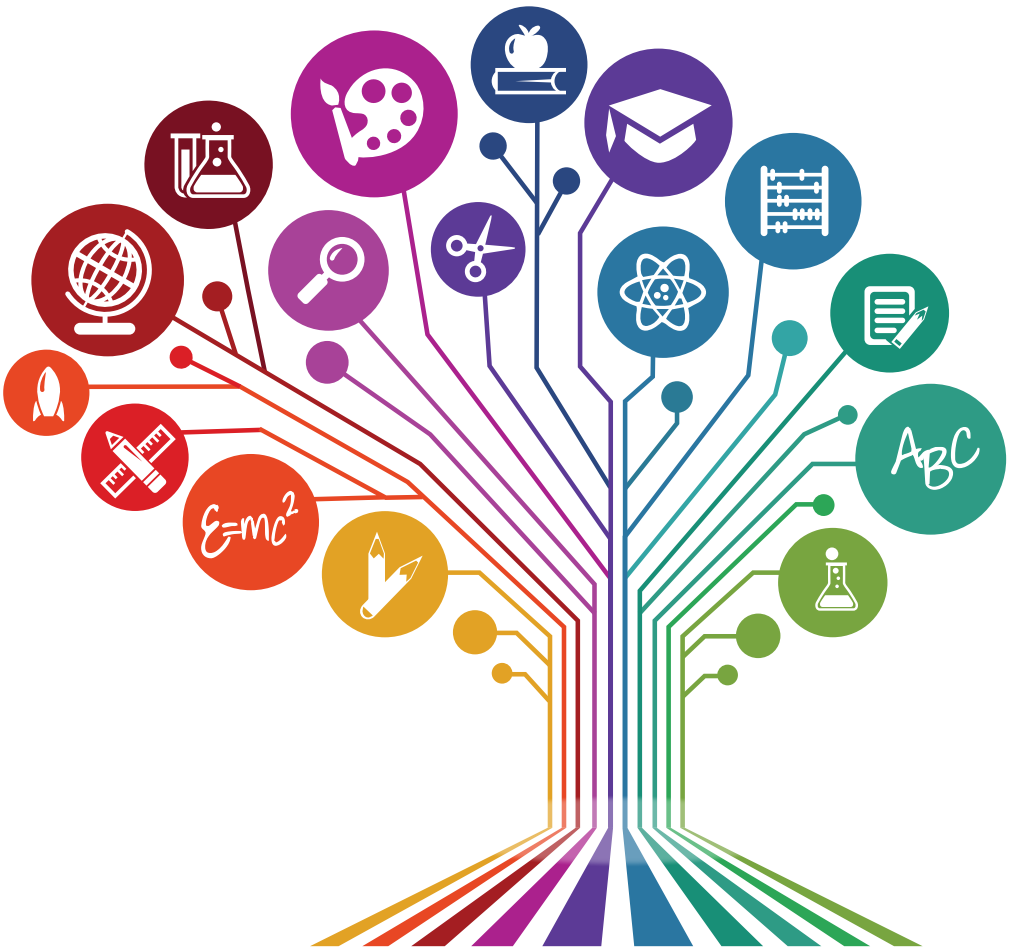
GEMS Education is the world's leading education company, and through its experience and network of world-renowned experts, including educators and consultants, GEMS continues to be at the forefront of educational development and reform. GEMS Education's ideas and strategies are proven, in its own schools and through work undertaken for clients around the globe.

Global Reach

GEMS is a world leader in cutting-edge education, ensuring excellence and operational effectiveness across its network of schools.

Key Facts

- **Largest** K-12 education company in the world
- Global network of **award-winning schools**
- Educating over **250,000** students representing **173** different nationalities
- Employing over **20,000** education specialists and staff from over **115** countries



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