

# Policy for Educational Transformation:

## An Educational Policy Brief



Robert B. Kozma, Ph.D.

Kozmalone Consulting

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*Education is a fundamental human right. It provides children, youth and adults with the power to reflect, make choices and enjoy a better life. It breaks the cycle of poverty and is a key ingredient in economic and social development.* UNESCO<sup>1</sup>

The task of the policymaker is to turn the words above into reality. The purpose of this policy briefing is to help policymakers articulate a vision, develop a master plan, implement initiatives, and evaluate and adapt these initiatives, relative to the vision. As such, the intent is to maximize the impact of policies on education systems. This paper provides a process for policymaking, identifies key issues that often must be addressed in policies, and provides some suggestions for strategies that can address these issues.

Throughout the briefing, examples are cited, drawn from countries around the world. A detailed case study is presented in the appendice. The examples and case study focus on Information and Communications Technologies (ICT) policies. The process and strategies used to formulate ICT policies can be used in formulating policies in other components of the education system, such as curriculum and assessment, teacher professional development, and research and evaluation.

### Key Characteristics of Transformational Policy

- Systemic
- Coherent
- Action-oriented
- Provides for local participation
- Innovative and scalable
- Provides financial resources

### Drivers of Education Policy

Converging global trends have created enormous economic and social challenges and significant opportunities for education policymakers. Despite the recent global economic downturn, there continues to be a massive industrial buildup in some countries, while in others the labor market is dividing between low-pay service jobs and high-pay, knowledge-economy jobs<sup>2</sup>. In parallel with macro-economic changes, industries and firms are engaged in significant organizational and behavioral shifts, such as organizational flattening, decentralized decision making, and the use of task teams, cross-organizational networking, flexible work arrangements, and just-in-time inventory. Many of these changes have been enabled by the use of ICT for communication, information sharing, the design of new products, and the simulation of business processes<sup>3</sup>.

<sup>1</sup> Education for All: An Achievable Vision. Paris: UNESCO.

[http://www.unesco.org/education/efa/global\\_co/policy\\_group/EFA\\_brochure.pdf](http://www.unesco.org/education/efa/global_co/policy_group/EFA_brochure.pdf)

<sup>2</sup> Levy, F. & Murnane, R. (2005). *The new division of labor: How computers are creating the next job market*. New York: Russell Sage Foundation. Autor, D. (2010). *The polarization of job opportunities in the U.S. labor market*. McKinsey and Company, retrieved on August 1, 2010, from [www.americanprogress.org/issues/2010/04/pdf/job\\_polarization.pdf](http://www.americanprogress.org/issues/2010/04/pdf/job_polarization.pdf)

<sup>3</sup> Tapscott, D. & Williams, A. (2008). *Wikinomics: How mass collaboration changes everything*. New York: Penguin Group.

In developed countries, ICT is pervasive across society—from cell phones, to low-cost video cameras, personal digital assistants, and laptops wirelessly connected to the internet—and it has impacted the way people work, play, and live. But even in developing countries, instances have emerged where ICT has increased farm productivity, improved community life, and created opportunities to participate in the global economy.

Overlaid on these trends are the Millennium Development Goals<sup>4</sup> and Education for All<sup>5</sup>. In the year 2000, the largest gathering of world leaders in history committed their nations to reduce extreme poverty by 2015. Among the goals to accomplish by this date are to eradicate hunger, achieve universal primary education, reduce infant mortality, and promote gender equality. In addition, Education for All aims to provide free, compulsory, high-quality education and promote the acquisition of life skills for adolescents and youth.

“The Hashemite Kingdom of Jordan has the quality competitive human resource systems that provide all people with lifelong learning experiences relevant to their current and future needs in order to respond to and stimulate sustained economic development through an educated population and a skilled workforce.”

King Abdullah II  
Hashemite Kingdom of Jordan  
General Framework: Curriculum and Assessment  
Ministry of Education Jordan

These converging trends put tremendous stress on education and other social systems responsible for preparing society for the future and moderating the adverse impact of social and economic change. All of these trends have implications for education: who goes to school, the preparation of teachers, what is taught, even how teaching and learning are assessed. Old educational models no longer work as these converging trends require policymakers to transform their school systems to meet new demands. Transformational policies can lay the foundations for economic prosperity and social advancement. The following section outlines a model for the policy development process. The subsequent section describes the characteristics of transformational educational policies.

### **A Model for Policy Development**

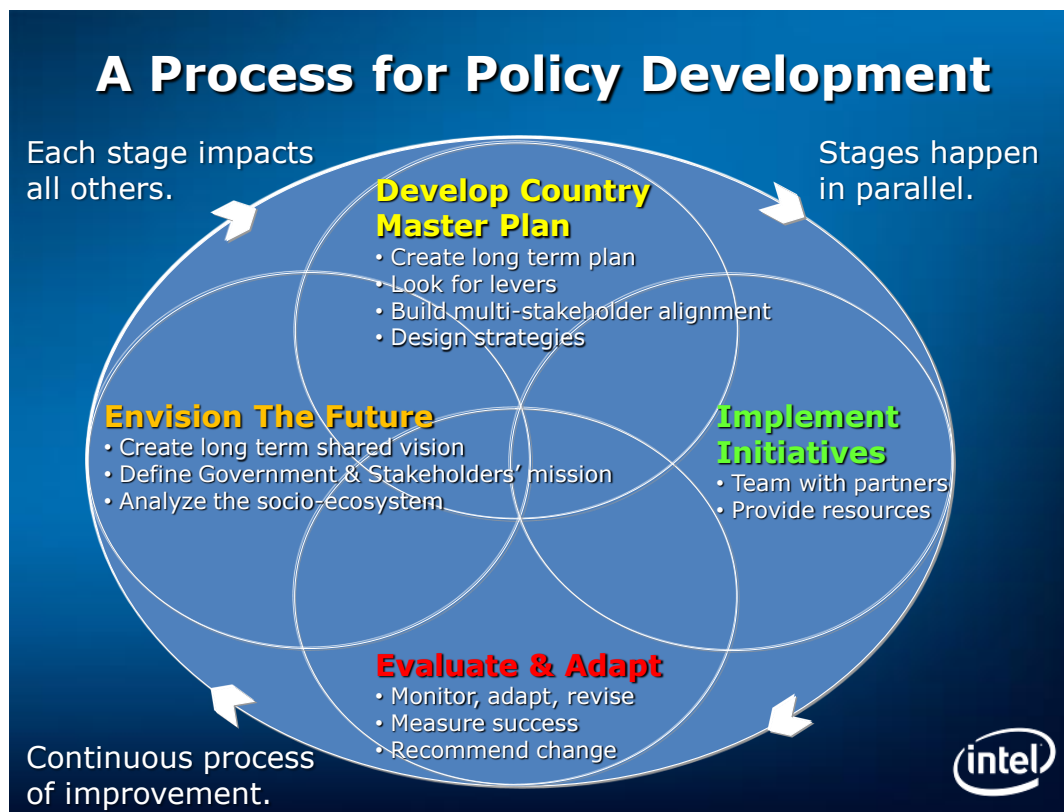
Policymakers are in a unique position to influence the direction and scope of educational change. By generating a long-term, shared vision, developing a policy master plan, implementing initiatives, and evaluating and adapting efforts, education leaders can craft policies that make huge contributions not only to the education system but to a nation’s economy and social welfare. The following four-step process can help leaders formulate policies that support education reform and economic and social development. This process was used recently with the Ministry of Education in the Kingdom of Jordan, to help them develop their ICT plan and strategy, in the context of their Education Reform for the Knowledge Economy (ERfKE) and this case is featured among other countries in the text below and in the more-detailed case study in the appendix<sup>6</sup>.

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<sup>4</sup> <http://www.un.org/millenniumgoals/>

<sup>5</sup> [http://www.unesco.org/education/efa/ed\\_for\\_all/](http://www.unesco.org/education/efa/ed_for_all/)

<sup>6</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.



## ***Envision the Future***

*Create a long-term shared vision.* Sometimes the policy development process starts with someone—often the Prime Minister, President, or the King—who articulates a high-level vision of what education should be like to ensure the Nation’s future wellbeing. This happened in Portugal, Rwanda, and Jordan, among others. For example, in Portugal, Prime Minister Jose Socrates launched the Magellan Initiative, a project aimed at giving a laptop computer to every primary school student, as part of a larger vision, called “Plano Tecnologico”, to develop a high tech economy in the country<sup>7</sup>. In Rwanda, President Paul Kagame promoted ICT in education to support increased access to formal and informal basic education<sup>8</sup>. In Jordan, the King Abdullah envisioned a transformed educational system in which ICT would contribute to a knowledge economy in the country<sup>9</sup>.

If a vision has not been articulated, begin the policy making process by developing one, for it gives focus to all that follows. The vision should be long-term, not a year or five years but at least ten years into the future. In Jordan, changes were targeted that would transform the education system by the year 2025.

<sup>7</sup> Coppock, K., Smith, B., & Howell, K. (2007). Measuring the economic impact of Magellan: A first look. Palo Alto, CA: Vital Wave Consulting.

<sup>8</sup> Issacs, S. (in press). ICT in education policies: Rwanda. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>9</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

Work with multiple stakeholders to create such a vision. Envisioning meetings are a useful mechanism in which Ministry officials, school and teacher leaders, business leaders, parents, and even students participate. Even when a high-level person has articulated a vision, it is useful to convene such a meeting to generate buy-in and support. Envisioning meetings are like brainstorming sessions where people are asked to think outside the box and be as creative as possible.

To start, publish and promote the articulated vision, if there is one. As these visions are often stated in broad terms, use an envisioning session to identify and generate detailed, graphic pictures of the future: what classrooms (if they continue to exist) will look like and what students and teachers will be doing, the everyday activities in which they are engaged, the facilities and resources they have, how they use them, etc. All aspects of the system should be addressed: teacher professional development, curriculum and assessment, ICT, and research and evaluation.

Each person can define their own personal vision statement, or vision statements can be created by small groups of participants. In either case, share all visions with the whole group in a full session. Like a brainstorming session, criticism—especially that of “it can’t be done” sort—is prohibited. Once all of the statements are shared, the convener looks for commonalities. Similarities and distinctions are clarified by the participants. The goal is to align and achieve a shared vision or visions of what people want schools to be like in the future.

It is sometimes difficult to get people to think “outside the box”; the envisioning convener can help by providing some warm-up exercises which get participants’ to think creatively. In Jordan, a few brief videos were shown of innovative schools produced by the George Lucas Education Foundation (<http://www.edutopia.org/video>). These videos showed people that schools can look radically different than traditional schools and they provided a concrete sense of what innovative schools can really look like. In one school, the entire curriculum, pedagogy, and assessment were organized around real world projects. The second was a school-work arrangement, where students spent part of their school week as interns in an architectural firm, while taking companion project-based courses that integrated math into architectural projects.

*Define government and stakeholders’ missions.* Many ministry departments are involved in educational transformation—the departments of curriculum, assessment, teacher training, and ICT are all important contributors. Other stakeholders can make important contributions, as well—private sector industries and businesses, parent and community groups, professional organizations and unions, NGOs, and donors. It is important to identify all the stakeholders and specify their missions. This will provide information needed to analyze the socio-ecosystem and identify potential partners for change.

*Analyze the socio-ecosystem.* The outcome of the envisioning session is a clear vision and a concrete set of images that can serve as a set of measurable goals to attain in ten years or fifteen years. The “socio-ecosystem analysis” brings the process back to the current world. Analyze the situation as it is right now. What does the current situation in schools look like? What are the strengths of the system? What are the weaknesses? What are the local and global demands and local expectations? What are the challenges and impediments to change? The socio-economic analysis may involve reading reports, visiting schools, and interviewing teachers, school leaders, and Ministry officials. Go beyond the specific focus of the policymaking and include the whole context, including global trends and world-class standards. Even if the policy is focused on a particular area, like ICT, consider the current

state of all the components of the system: curriculum and assessment, teacher professional development, research and evaluation.

When considering the ICT policy in Jordan, schools were visited, along with their computer labs and other classrooms. Teachers and principals were interviewed, as were officials from the Ministry's ICT department and other departments of the Ministry --those in charge of teacher professional development, curriculum, assessment, and planning. People in the Ministry of ICT were also interviewed.

The situation analysis helps identify the best starting points to work toward policy goals, the strengths on which to build, and the weaknesses to address. The situation analysis is the basis for developing the long-term master plan and trajectory that moves toward the vision.

### ***Develop a National Master Plan***

*Create a long-term plan and trajectory.* Before starting to identify short-term plans and programs, progress can best be defined by creating a long-term trajectory, perhaps in five year phases. Then identify short term plans and programs which define progress against the long term vision. This assures short-term plans will contribute to ultimate long-term goals. For example, in 1997 Singapore created a series of ICT master plans of five years each<sup>10</sup>. A trajectory started with an emphasis on equipping schools and classrooms, moved to embedding ICT into the curriculum, and then shifted to collaborative learning pedagogy and teacher communities of practice. In Jordan, the immediate focus of the ICT plan was to design a strategy for the years 2011-2015<sup>11</sup>. A trajectory was described that took the Ministry out to the next fifteen years, in five-year phases. Before the action plan was designed for the first five years, the key goals were specified for each five-year phase until the year 2025. Using this approach, it could be shown how the goals for the end of the first five years contributed to the vision for 2025.

*Look for levers.* A complex system is composed of a constellation of interlocking, mutually reinforcing components that make the system robust. This interconnection makes it very difficult to change the system because a change in one component has implications for all of the others, and the status quo in those components creates resistance that is a major barrier to change. Education change, particularly education transformation, means changing many things, sometimes the whole system. Yet everything cannot change at once. The challenge then is where to start. The answer is often opportunistic and always depends on the situation.

The situation analysis provides a picture of the strengths of the system, as well as its weaknesses. One approach to education change is to build on strengths—those components that are closest to the target goals. Building on strengths can provide a lever to make changes in all other parts of the system. The introduction of a new component, such as ICT, can also be used to launch change in other components. However, it is important to keep in mind that merely introducing new technology will not bring change by itself. It is best to link new technology with other changes. This was clearly the case with the ICT master plan in Singapore, where the distribution of

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<sup>10</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>11</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

computers in schools was used as a lever to change pedagogy and curriculum content. In Jordan, ICT was connected with teacher professional development—one of the areas of strength—to develop new pedagogical models that incorporate new technologies<sup>12</sup>.

*Build alignment.* The key element in designing a policy strategy is to use the levers identified to realign the other components and move toward your goals and vision. Identified levers are the start, and over the upcoming years, bring about changes in other components to create a new constellation of mutually reinforcing components. Consequently, design a way to, over time, bring all of the stakeholders and components into an alignment that works toward the defined goals and vision. In 2008 in Singapore, an evaluation focused on components that were out of alignment at the end of Master Plan 2; the evaluation acknowledged that while ICT had become part of the curriculum, teachers still had not integrated it into their teaching and they needed additional professional development to do so<sup>13</sup>. In Jordan, the five-year plan started with ICT, teacher professional development, and pedagogy<sup>14</sup>. The goal of the first couple years coordinate these to focus on increasing the use of “blended learning.” Subsequent years are to focus on realigning curriculum and assessment around the integration of ICT into schools and on using information management systems to support local decision making of principals.

*Design strategies and initiatives.* With a trajectory set, the levers identified, and a plan for aligning the components over time, you have the basic structure for designing a short-term, five-year strategy. Begin filling in this strategy by setting specific measurable goals for each target component at the end of five years; for example, 100% of the teachers will be trained in the use of blended learning to integrate ICT into their teaching, 90% of the teachers will use blended learning in at least one of their lessons or classes each week and 70% will use it two or more times a week. These were the goals set in Jordan’s ICT plan for the end of five years. Next, take these goals and go backward through the five years of the plan, setting intermediate goals that would lead up to those of the final year. In the case of Jordan, at the end of the fourth year, 75% of the teachers will be trained, 75% will use it in at least one class and 50% in two or more classes. With the final and intermediate goals in mind, identify actions, programs, or initiatives that will achieve these goals for each of the targeted areas of change.

In Jordan, it was proposed that in the first year of the plan, the Ministry of Education adopt the UNESCO ICT Competencies for Teachers to identify or develop training materials targeted at these competencies<sup>15</sup>. With the goal to provide all primary school children with networked laptops in Uruguay, Plan Ceibal set out four stages in which all students in one target rural school received laptops, followed by all students in the province in which that town was located, followed by all students in the country outside of the primary metropolitan area of the capital,

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<sup>12</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>13</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>14</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>15</sup> UNESCO (2008). ICT competency standards for teachers. Paris: UNESCO.

followed by all students in the capital<sup>16</sup>. In parallel, schools were set up with wireless hotspots, teachers were trained in the use of the computers in their teaching, and digital contents and activities were developed.

### ***Implement Initiatives***

*Team with partners.* Strategy implementation is a challenging task. It requires significant resources, as described below, but also a management structure. Some person and/or department must be responsible for making sure the plan is implemented. Early in the implementation, a team should be identified that spans across the relevant departments to assure various efforts within the Ministry are coordinated.

In Jordan, a Development Coordination Unit was set up in the Ministry that drew on each of the directorates or divisions within the Ministry to oversee the implementation of various programs related to the Education Reform for the Knowledge Economy, including the ICT Plan<sup>17</sup>. In Singapore, the Educational Technology Division worked with other Divisions within the Ministry, such as the Curriculum Planning and Development Division and the Training and Development Division, to implement their master plan<sup>18</sup>. In addition, the Ministry of Education worked closely with the Infocomm Development Authority, the government agency responsible for the national ICT grid and for developing a competitive ICT industry in Singapore.

Cooperation among ministries, such as the Ministry of Education, the Ministry of ICT, the Ministry of Higher Education, or the Ministry of Labor, can dramatically increase the support for, scope, and impact of policies and their implementation. In Chile, a National Digital Strategy was developed through the cooperation of the Ministries of Economy, Education, Finance, Transportation and Telecommunications, and the General Secretariat Minister of the Presidency<sup>19</sup>. Finland's Ubiquitous Information Society Plan was developed under the aegis of the Ministry of Transport and Communications with participation from the Ministries of Education, Employment and the Economy, Social Affairs and Health, Justice, Finance, Defense, and the Interior. In Portugal, the Magellan Initiative was a collaboration between the Ministry of Public Works, Transportation, and Communication and the Ministry of Education<sup>20</sup>.

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<sup>16</sup> Hinoistroza, J.E., Jara, I., Brun, M. (in press). ICT in education policies: Uruguay. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>17</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>18</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>19</sup> Ministerio de Economico (2008). Plan de accion digital: 2008-2010. Santiago, Chile: Ministerio de Economico.

<sup>20</sup> Coppock, K., Smith, B., & Howell, K. (2007). Measuring the economic impact of Magellan: A first look. Palo Alto, CA: Vital Wave Consulting.

University involvement can be important, too. In Norway, the National Center on Technology in Education at the University of Oslo played an important role in working with the Ministry of Education to develop the national curriculum in digital literacy<sup>21</sup>.

Private-public partnerships can also play an important role. In addition to contractual arrangements with the private sector, some companies may be able to contribute resources or programs that would fit policy vision, goals, and strategies. The private sector made direct contributions to ICT programs in Portugal, Estonia, Hong Kong, Singapore, and South Korea, among other countries<sup>22</sup>. The World Economic Forum worked with private sector companies to support major education reform initiatives in Jordan, Egypt, Palestine, India, and Rwanda<sup>23</sup>.

Donors and NGOs can be part of the mix, as well. World Bank funding supported education efforts in Jordan and Namibia, among many other countries<sup>24</sup>. Having the vision, goals, and strategies in place, allows the Ministry to focus and coordinate diverse contributions that might otherwise go in divergent directions.

*Provide resources.* Successful implementation is highly dependent on the allocation and management of adequate resources. These include personnel and materials and, in the case of ICT policy, hardware, software, networks, maintenance, and technical assistance. Detailed resource specifications, including budget, should be developed as soon as the strategy is finalized. These resources should be mobilized according to the strategy schedule. Financial resources are, of course, an important component of this.

Singapore invested \$1.2 billion in their ICT master plans between 1997 and 2002. Spending on education improvement increased in 2009, despite a significant economic downturn. On the other hand, implementation of ICT plans in Rwanda and Namibia have been limited by budgetary constraints. The financial resources that exist must be converted to specific spending priorities, such as the purchase of equipment, the training of teachers, and the purchase of digital content. Denmark, Finland, France, Hong Kong, and the Netherlands are among the countries that have invested in the development and distribution of educational digital content. South Korea plans to replace paper-based textbooks with digital content by 2013.

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<sup>21</sup> Erstad, O. & Quale, A. (2009). National policies and practices on ICT in education: Chile. In T. Plomp, R. Anderson, N. Law, & A. Quale (eds.), *Cross-national information and communication technology: Policies and practices in education*. Charlotte, NC: Information Age Publishing.

<sup>22</sup> Center for Technology in Learning (in press). *International experiences with technology in education: Final report*. Washing, DC: Department of Education.

<sup>23</sup> <http://www.weforum.org/issues/education>

<sup>24</sup> Alnoaimi, T. (in press). *ICT in education policies: Jordan*. In R. Kozma (ed.), *ICT policies and educational transformation*. Paris: UNESCO. Issacs, S. (in press). *ICT in education policies: Namibia*. In R. Kozma (ed.), *ICT policies and educational transformation*. Paris: UNESCO.

## ***Evaluate and Adapt***

*Monitor, adapt, and revise.* Monitoring, adapting, and revising are essential steps to policy success. A mechanism should be set up that would allow managers and participants to monitor the implementation of strategies and initiatives and progress toward goals. This will enable managers and participants to identify problems and shortcomings, adapt to changing conditions, and make revisions in strategies and initiatives.

*Measure success.* Early in the policymaking process, the goals should be expressed in measurable terms. Indicators should be identified that will be used to measure implementation progress and anticipated outcomes at various points in time. Some monitoring data (such as attendance, grades, equipment purchase and distribution) can be collected as part of the Ministry's regular information management system. For other information, instruments will need to be designed—interview protocols, surveys, observation protocols, etc. A schedule for data collection should be set, along with review events, throughout the period of the policy. The management team should use this information to make modifications and adjustments in the strategy, based on the results. A final-year evaluation can identify and document success, address problems, and set up the requirements for the subsequent phase of the long-term strategy.

Jordan, in their ICT Plan, specified the need for a steering committee composed of participating divisions within the Ministry that would meet regularly to report on the progress toward each goal; the committee would then report to the Minister<sup>25</sup>. Portugal has focused the evaluation on the high tech jobs created, given their goals of economic development<sup>26</sup>. So far, Portugal has generated approximately 1,500 jobs for software engineers, service providers, and telecommunications providers through its Magellan project.

*Recommend change.* Continuous monitoring and periodic evaluation will provide managers with the information needed to make changes to their subsequent master plan. Singapore has periodic reviews scheduled throughout its master plans and, in the final year of a five-year plan, a summative review that involves an international review panel is charged with examining the findings across the years of the project<sup>27</sup>. Based on these reviews, the international review panel makes recommendations for the next master plan.

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<sup>25</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>26</sup> Coppock, K., Smith, B., & Howell, K. (2007). Measuring the economic impact of Magellan: A first look. Palo Alto, CA: Vital Wave Consulting.

<sup>27</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

## Policy Issues, Constraints, Challenges, Opportunities and Recommendations

While process is important, substance is essential. To be transformational, education policies must address the entire system: Curriculum and assessment, professional development, ICT, and research and evaluation. This section identifies and discusses the key policy issues that confront education leaders as they engage in the policy making process.



Intel's Education Transformation Model

### *Policies related to curriculum and assessment*

Traditionally, curriculum policies have focused on the “scope and sequence” of the topics or materials “covered” by teachers and textbooks. Often, these policies would specify the topics in great detail and provide a schedule of dates by which each would be introduced, to ensure that all of the topics are covered. Curriculum inspectors or supervisors would visit schools to ensure these schedules are uniformly followed throughout the country. Assessments, often using multiple choice tests, would focus on the students’ recall of the material covered.

Contemporary curriculum policies are much more concerned with standards and student outcomes: that is, the skills and capabilities students must have at different stages of progress. Increasingly, these curriculum standards focus on the key concepts of the subject domains, those that serve to organize and connect the facts within the subject. These standards also focus on the students’ ability to apply these concepts to solve complex, real world problems.

In many countries, the curriculum is starting to include cross-domain, “21<sup>st</sup> century skills”, such as creativity, critical thinking, problem solving, learning to learn, communication, collaboration, and information and ICT literacy. More and more, these skills are articulated as regional or global standards in multinational forums, such as the European Commission, the OECD, the IEA, and UNESCO.

In Jordan, the curriculum policy, the ICT policy, and the assessment policy all focus on the “knowledge economy skills” of communication, collaboration, problem solving, and critical thinking<sup>28</sup>. In Singapore, all three of its master plans align ICT, the curriculum, and assessment<sup>29</sup>. In the State of Maine, the one-to-one laptop program focused on teacher preparation and professional development and changes in the curriculum to support 21<sup>st</sup> century skills and economic development<sup>30</sup>.

Correspondingly, assessments are changing, as well. While the dominant mode of assessment is still the paper-and-pencil, multiple-choice standardized test, assessments in some countries are being delivered via ICT. For example, Denmark administered all national, grade-level tests totally online<sup>31</sup>. Along with this development are more-

<sup>28</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>29</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>30</sup> Silvernail, D. (2009). Research and evaluation of the Maine Learning Technology Initiative (MLTI) laptop program. Gorham, ME: Center for Education Policy, Applied Research and Evaluation.

<sup>31</sup> Center for Technology in Learning (in press). International experiences with technology in education: Final report. Washing, DC: Department of Education.

advanced uses of computers to present complex problems and tasks, such as simulations and multi-media case studies. Both key domain concepts and 21<sup>st</sup> century skills are integrated into these assessments.

Australia and Hong Kong have national online assessments of ICT literacy that engage students in the use of ICT to solve complex problems<sup>32</sup>. Australia, England, Finland, Portugal, Singapore, and the United States are participating in an international project to develop advanced, ICT-based assessments of 21<sup>st</sup> century skills<sup>33</sup>. Complementing these summative assessments are school-based, formative assessments that include performance assessments and portfolios, increasingly digital portfolios, of students' work. In Australia, upper-secondary students use ICT to develop e-portfolios of their work<sup>34</sup>. These student portfolios are not only used by teachers for formative assessment but are collected on the national learning management system and can be shared with a student's perspective employer upon graduation.

Reform policies can serve to greatly improve the nation's curriculum standards and assessments and dramatically increase the skills and competencies of students and, ultimately, the capacity of the labor force and society, more generally. Policies can articulate the importance of these changes, create frameworks that can be developed by curriculum leaders, and provide resources to promote implementation.

### ***Policies related to professional development***

Traditionally, teacher professional development has been limited to a few courses or intensive workshops offered during school breaks. These may be supplemented by an occasional after-school workshop focused on a new technique or a recently introduced policy. The assumption has been that the bulk of what teachers need to know was acquired in their own college years and they needed only an occasional update.

Contemporary policies view professional development as a career-long process. Professional development services are provided in an ongoing basis. Teachers are proactively engaged in this process; they identify their own professional development goals and the means towards accomplishing them. Teachers are forming professional communities of co-learners, sharing new knowledge and skills and the products of their work. In some cases, teachers generate this new knowledge as they engage in action-research projects that employ and evaluate a new technique that they may have developed individually or collectively.

ICT is increasingly used to support each of these professional development activities by providing teachers with self-assessment and monitoring tools, learning resources, and community building and sharing environments. This approach is central to two initiatives in Singapore's third ICT master plan: the EduLab initiative and the FutureSchools initiative<sup>35</sup>. The EduLab initiative supports and encourages teacher professional development and innovativeness in developing, planning, and delivering ICT-enriched experiences. The FutureSchools initiative

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<sup>32</sup> Center for Technology in Learning (in press). International experiences with technology in education: Final report. Washing, DC: Department of Education.

<sup>33</sup> <http://atc21s.org>

<sup>34</sup> Center for Technology in Learning (in press). International experiences with technology in education: Final report. Washing, DC: Department of Education.

<sup>35</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

pushes this concept by encouraging ICT-based experimentation to redefine professional learning communities, among other school conditions, such as learning and teaching practices, time, environment, and infrastructure.

ICT skills are becoming an increasingly important part of teachers' own development, for administrative purposes, and for their use in the classroom. Accordingly, ICT skills have become an important component of professional development curricula. Estonia ties teacher promotions to ICT skills, among others. Chile, England, and France are among nations that now link ICT competencies to teacher licensing requirements<sup>36</sup>.

Important too are new pedagogical techniques that take advantage of the new capabilities of ICT and better teach and assess the new 21<sup>st</sup> century skills that students need. In the US State of Florida, a central goal of their ICT policy is the integration of technology into the curriculum through professional development and the use of research-based instructional methods<sup>37</sup>. Classroom observations conducted as part of the policy's evaluation found significant increases in student engagement in project-based learning, independent student inquiry, and student use of technology as a learning tool or resource.

The UNESCO ICT Competency Standards for Teachers weave together ICT skills with other important teacher competencies in curriculum, pedagogy, and assessment and are an excellent resource for policymakers<sup>38</sup>. The teacher professional development efforts of the ICT policies of both Jordan<sup>39</sup> and Rwanda<sup>40</sup> are linked to the UNESCO standards.

### ***Policies related to ICT***

The introduction of new technologies is often an opportunity to review current policies and introduce new ones. ICT can be a lever used to initiate changes in other parts of the system, such as pedagogy, curriculum, and assessment. In the US State of Maine, a one-laptop-per-student program, the Learning Technology Initiative, was used as a lever to change pedagogy and curriculum content<sup>41</sup>. A series of ICT master plans in Singapore have been used to support a range of changes in the education that align the system with the country's economic development goals<sup>42</sup>. In Jordan, the ICT Policy supported changes in teacher professional development, curriculum

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<sup>36</sup> Center for Technology in Learning (in press). International experiences with technology in education: Final report. Washing, DC: Department of Education.

<sup>37</sup> Center for Research in Education Policy (2007). Florida's enhancing education through technology: 2006-2007 evaluation report. Memphis, TN: Center for Research in Education Policy.

<sup>38</sup> UNESCO (2008). ICT competency standards for teachers. Paris: UNESCO.

<sup>39</sup> Alnoaimi, T. (in press). ICT in education policies: Jordan. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>40</sup> Issacs, S. (in press). ICT in education policies: Rwanda. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>41</sup> Silvernail, D. & Bluffington, P. (2009). Improving mathematics performance using laptop technology. Gorham, ME: Center for Education Policy, Applied Research and Evaluation.

<sup>42</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

development, and local school decision making<sup>43</sup>. So while ICT strategies should include matters of hardware, courseware, networking, and information systems, these resources should be configured and used to support other policy changes.

Strategies derived from the ICT policy should provide the amount and capabilities of computers, printers, multimedia equipment, etc. to meet the instructional objectives envisioned by the policy. Often, this means easy access to broadband-connected computers for all teachers and students. The software applications, courseware, and digital tools and resources should support the intended pedagogy and curriculum. In this context, the US State of Texas extended the funding of traditional textbooks to include digital content, software, tools, models and online courses<sup>44</sup>. The network should be of the capacity to support the intended instructional and administrative uses of ICT and how these responsibilities are distributed throughout the system. Finally, the policy should also include provisions for technical support and maintenance.

### ***Policies related to evaluation and research***

Effective policies depend on data, research, and evaluation in two ways: 1) Research results on effective teaching and learning informs effective policy and practice. 2) Continuous revision and improvement depend on an effective information management system. Policies and programs should include a monitoring and evaluation component that schedules milestones and data collection points so as to provide policymakers and administrators with ongoing information on the implementation, progress, and outcomes of policies.

As mentioned, Singapore has periodic reviews scheduled to inform its ICT policy and a part of its ICT policy are the EduLab and the FutureSchools initiatives that encourage teacher field-based research and innovation<sup>45</sup>. Jordan has a periodic review process embedded in its ICT policy that will monitor progress and inform decisions<sup>46</sup>. In addition, one component of the plan is to use an information management system to supply Ministry officials, principals, and teachers with data that would support continuous improvement decision making.

### ***General policy considerations***

Apart from considerations for policies related to specific issues, such as ICT or curriculum and assessment, policymakers should keep in mind other things that will maximize the impact of their policy decisions. There are a number of characteristics of effective policies and these characteristics should be incorporated into policy decisions.

*Systemic reform.* A system is composed of interconnected, mutually reinforcing components. A change in one component influences and is influenced by others. Effective policies acknowledge and address this systemic nature. Even when a policy is focused on only one part of the system, such as ICT or curriculum, it addresses all of the other

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<sup>43</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>44</sup> Intel Education (2010), Texas transforms education with innovative policy (white paper). Santa Clara: Intel Corp.

<sup>45</sup> Wong, P. (in press). ICT in education policies: Singapore. In R. Kozma (ed.), ICT policies and educational transformation. Paris: UNESCO.

<sup>46</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

parts. So, for example, Jordan included action plans related to teacher training, curriculum, pedagogy, assessment, and school organization in its ICT policy<sup>47</sup>.

*Coherence.* Related to this systemic nature, reform policies should be coherent. There are two types of coherence to consider and plan: horizontal and vertical. Horizontal coherence connects and aligns policies and programs across related administrative units within the Ministry. That is, the ICT policy should align with and support the curriculum policy, the professional development policy, and other policies, and these policies should support the ICT policy. This type of alignment comes from the coordination with and involvement of other organizational units in the decision making process and policy implementation. The management of this can be effectively done by a cross-ministerial team, perhaps chaired by the Minister or Permanent Secretary. This horizontal coordination can even extend across relevant ministries, such as education, ICT, youth and families, labor, and finance.

Vertical coherence connects and aligns policies and programs through the hierarchical levels, such as federal and state or provincial agencies. In many countries, there are intermediate agencies between the national government and the schools and classrooms where the policies are to be implemented. Often these intermediate levels have a certain amount, maybe a lot, of policy-making authority of their own. To reach the schools and classrooms, national policymakers should involve regional policymakers in the decision process and coordinate programs and implementation with regional efforts. Australia has a highly decentralized education system, with most education decision making done at the state level<sup>48</sup>. Yet with the Digital Education Revolution, the Federal Government entered into a partnership with its States to promote and provide ICT and broadband connections for all secondary schools, increase the level of ICT proficiency for teachers, embed the use of ICT in teaching and learning, provide for online curriculum tools and resources, and enable parents to participate in their child's education through online access.

*Action-oriented.* Effective policies are action-oriented. They do not just articulate a vision or a set of values or goals but specify actions, programs, and projects to achieve these goals. Conversely, the programs and projects must be specifically linked to the policy visions and values on which they are based. Local administrators and teachers who are engaged in new programs and projects must understand how they are contributing to the goals and visions defined by policies.

*Local participation.* While national policies define visions and goals and initiate programs for implementation, education reform can benefit from structuring policies to allow for considerable local participation and innovation. Programs can be structured to create opportunities and build mechanisms for teachers and principals to design program variations and projects that contribute to policy goals but also address local needs and conditions. At the same time, local implementation must be held accountable for contributing to the national goals.

*Innovation and scale.* The ultimate challenge for any policy is to have its effects spread widely throughout the education system. An important characteristic of transformational policy is it has a path or trajectory by which

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<sup>47</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>48</sup> Center for Technology in Learning (in press). International experiences with technology in education: Final report. Washing, DC: Department of Education.

initial changes will diffuse throughout the system. Oft-used strategies start by seeding “innovative” or “lighthouse” schools or by creating special funding that is given to schools or districts that volunteer for participation in new, policy-supported approaches. Transformative policy specifies mechanisms by which such innovations, once proven, can be shared with and adopted by other schools. The laptop program in Maine had a planned trajectory that started by providing all of the teachers and students in grades 7 and 8 with their own laptop in 2002<sup>49</sup>. In 2007, all high school teachers were given their own laptops and in 2009 all high school students received laptops. In the Jordan ICT plan, one strategy is to create “Lead Schools,” schools that are resourced to engage in innovation and have plans for involving other schools in their efforts<sup>50</sup>.

*Financial support.* Money is always a critical factor in implementing effective policies. High-sounding intentions are usually free of cost but it takes money to set up the programs and purchase equipment and resources that will make the policy work. Australia set aside A\$ 2.4 billion to promote and provide ICT and broadband connections for secondary schools with its Digital Education Revolution. It is tempting to pass along some of these costs to schools, teachers, and students or their parents<sup>51</sup>. This is an acceptable strategy, on occasion. High-quality education has personal benefits people value and will pay for, if they are able. On the other hand, high-quality education benefits the public, as well—it improves the economy and society, generally. These are in many ways even more important than the personal benefits. In this regard, investment in educational improvement is a wise one from a policymaker’s perspective and can result in huge returns on the economy and society. Financing of educational change should not preclude those least able to pay for it.

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<sup>49</sup> Silvernail, D. & Bluffington, P. (2009). Improving mathematics performance using laptop technology. Gorham, ME: Center for Education Policy, Applied Research and Evaluation.

<sup>50</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

<sup>51</sup> Center for Technology in Learning (in press). International experiences with technology in education: Final report. Washing, DC: Department of Education.

## Appendix 1: Jordan Case Study<sup>52</sup>

Note: Most national ICT policy case studies, of the sort you will find in the attached reference list, focus on the substance of the policies: what kind of infrastructure, how teachers are trained, what kind of content was developed, and so on. Few describe the process by which the policies were developed. Because there are so few descriptions of the process and because the author headed the team that advised the Ministry of Education in Jordan on their latest ICT policy, that is the focus of this case study. The process used in Jordan does not necessarily represent how policy is usually developed. Policy substance is included in this case study but for a deeper understanding of Jordan's ICT policy up to now, look at the excellent chapter on the subject written by Tayseer Alnoaimi in the UNESCO ICT policy book edited by Kozma, listed in the references.

The Ministry of Education (MoE) in Jordan requested a consultancy for its ICT Plan and Strategy, within the context of and funding for its Education Reform for the Knowledge Economy (ERfKE), the nation's overarching education reform program. The Development Coordination Unit (DCU) is the agency inside the MoE in charge of supervising the various projects of ERfKE, including the ICT policy consultation, and of coordinating these efforts across the Ministry's Directorates, or divisions. Part of this coordination involved a "Counterpart Team" composed of staff members from various Directorates who were interested in and potentially affected by the ICT policy, including the Directorate of Curriculum and Textbooks, the Directorate of Information Technology, and the Director of the Queen Rania Center, the organization tasked with implementing ICT-based programs and training. The Counterpart Team was chaired by this Director.

The consulting team used the process described in this briefing. In the first visit to the country, the consultants met with the Director and Counterpart Team to confirm agreement on the approach to the project. There were three purposes of the visit: to identify and elaborate on the MoE's vision for the future, to analyze the current situation, and to begin developing an ICT plan and trajectory.

King Abdallah's vision for the future is a Jordan in which education contributes to a growing knowledge economy. This vision was used as a starting point in an envisioning workshop held with the counterpart team and members invited from other directorates, including the Directorate of Planning and Tests and Examinations, the Directorate of Planning, and the Directorate of Training, and the Jordan Education Initiative, an autonomous organization supporting education reform. The envisioning exercises began by watching several video clips produced by the George Lucas Education Foundation; the video clips showed innovative schools in San Francisco, <http://www.edutopia.org/build-sf-learning-design-civic-education-video>, and in San Diego, <http://www.edutopia.org/collaboration-age-high-tech-technology-video>.

The large group was then divided into teams and given an envisioning assignment that asked them to look at the future with major changes in pedagogy or assessment or curriculum, and so on. After small group discussions, participants were brought back together to talk about common themes and shared visions. These visions were incorporated into a "Situation Analysis" report which was given to the DCU Director. The Situation Analysis included three other sorts of information: 1) interviews with key members of the various Directorates, 2) an analysis of over two dozen policy documents and reports related to reform initiatives, and 3) school visits with interviews with

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<sup>52</sup> Kozma, R., Vota, W., & Bsaiso, R. (2010). ICT policy and strategy, operational plan, monitoring and evaluation plan: For 2011-2015 and moving towards 2025. Amman, Jordan: Ministry of Education.

school principals and teachers. The Situation Analysis report summarized current efforts, elaborated on strengths, and identified problems related to ICT, teacher training, curriculum, pedagogy, assessment, and school organization.

It was concluded the current reform efforts had begun to move to a curriculum based on outcomes, rather than topics covered. Teacher training was moving to a standards-based approach in which key teacher skills had been identified. Assessments were being prepared for online delivery. And a school-development initiative was launched that would move more decision making to the local schools. The MoE had trained a large number of teachers in basic ICT skills and had installed computer labs in nearly every school. However, it was found that the ICT labs were being used to teach ICT as a subject. Regular teachers used traditional teaching methods, which rarely included ICT in their ongoing teaching, in part because of limited access to ICT and in part because they had no pedagogical model for integrating ICT into their teaching.

An overarching strategy and 15-year trajectory were outlined in which Jordan would move from its current state of traditional education to widespread use of a form of blended learning that mixed ICT and traditional methods, then to a phase in which ICT would support project-based learning, and finally to a phase in which pervasive access to ICT supported knowledge creation and contributed to a knowledge economy. The first five-year phase was the focus of the ICT Plan and Strategy.

In one strategy, laptops would be provided to each teacher. This was used as a lever along with teacher training to provide teachers with a pedagogical model—blended learning—that they could use to integrate ICT into their regular teaching practices.

In a second strategy, improvements in the system's education information management system would be used along with professional development of principals to support school-based decision making.

In a third strategy, a "Lead Schools" program would be set up in which schools that had already incorporated ICT into their teaching could apply for funds that would let them experiment with project-based innovations and bring partner schools into the innovation.

A fourth strategy would develop ICT-delivered assessments of "knowledge economy skills", which would be used to measure the progress and impact of these strategies. Outcome goals were listed for each of the strategies over the five years of the plan.

A management structure was proposed that would encourage coordination and alignment of these strategies with other reform initiatives with ERfKE. A set of action items was proposed for each strategy and associated with milestones of progress. Partner agencies were identified for each of the actions and a budget provided resources for each. Finally, a monitoring and evaluation plan identified indicators, and data collection methods were associated with each milestone and activity that would be used to monitor progress and establish the extent to which goals were met. In a second visit to the country, the plan and strategies were presented to the CDU Director, the Counterpart Team, and various other stake holders for feedback and revision.

## Annotated Bibliography

### *General Policy Resources*

Adolino, J. and Blake, C. (2011). *Comparing public policies: Issues and choices in industrialized countries* (second edition). Washington, D.C.: CQ Press.

This book is focused on the general field of public policy and the international comparative analysis of policy. It discusses the policy process and theories of policymaking, as well as the contexts of policymaking from the perspective of industrialized nations. It goes on to analyze a range of policies, including education, as well as immigration, taxation, health care, and social policy. For each policy area, the authors discuss common policy problems and policy options and then review the policies of six industrialized nations, as well as cross-national trends.

Fullan, M.(2010). *All systems go: The change imperative for whole system reform*. Thousand Oaks, CA: Corwin.

The book presents a rationale for whole-system education reform and discusses what can be done to bring it about. It analyzes the characteristics of an effective school district, using several districts as examples. It then presents strategies for achieving whole school reform at the district and school level, the state or national level, and the personal level.

Kubow, P. and Fossum, P. (2007). *Comparative education: Exploring issues in international context* (second ed.). Upper Saddle River, NJ: Pearson.

The book presents comparative education as a field of study and reviews several different theoretical approaches used in the field. The book then goes on to apply these in analyzing a number of contemporary educational issues, relevant to education policymakers, from the perspectives of different nations. The issues include: educational access and opportunity, accountability and authority, and teacher professionalism. It then goes on to analyze issues from local-global perspectives, using several different globalization analytic frameworks.

McKinsey & Co. (2007). *How the world's best performing school systems come out on top*. London: McKinsey & Co.

This is a study of the conditions that support the performance of the world's best education systems, among them Singapore and Finland. The study found that funding was not the determinant factor but teacher quality. It concluded that high-performing systems attract the best people to teaching, provide them with skills, and assure that the system is able to deliver the best possible instruction to every student.

### *Resources on ICT Policies*

Center for Technology in Learning, SRI International (pending). *International experiences with technology in education*. Washington, D. C.: U.S. Department of Education.

This Department of Education-sponsored report examines the ICT policies of 22 education systems. The report serves primarily to inform U.S. policy, so the systems selected are typically developed countries from North America, Europe, and Asia, with a few additional emerging countries that were selected for their informative value. The report includes cases studies from each of these systems, based on review of online resources and interviews with a national participant, typically from the Ministry or a university. The case studies and

subsequent cross-case analyses are organized around country context issues and around policy issues that are of particular interest to the Department of Education: the use of ICT to improve student learning, the use of ICT to improve teaching, and the use of data systems for continuous education improvement. A particular focus of the report is on measurement indicators related to each of these issues and the implications of these for Department participation in national and international studies.

Farrell, G., and Issacs, S. (eds.) (2007). *Survey of ICT in education in Africa*. Washington, D.C.: infoDev.

This two-volume set describes and analyzes ICT policies in education in 53 African countries. The first volume presents summary findings across topics, such as infrastructure, initiatives at the higher education and primary and secondary levels, activities and issues related to non-formal education, and issues related to gender equity. The second volume presents the 53 case studies, organized by a common template: the education system, ICT policies, current ICT initiatives and projects, and implementing ICT in education: what helps and what hinders.

infoDev (2007). *ICT in education toolkit for policy makers, planners, and practitioners*.

<http://www.ictinedtoolkit.org/usere/login.php>

This online toolkit of six “toolboxes” and a total of 19 tools provides interactive instruments and step-by-step guidance to assist users in mapping the national situation, creating a master plan, formulating interventions, planning for implementation, evaluation, and adjustment and scaling.

Koh, T. S., and Lee, S. C. (2008). *Information communication technology in education: Singapore's ICT masterplans, 1997-2008*. Singapore: World Scientific.

This book presents a detailed description of the goals and components of each of the country's master plans and then continues with chapters that detail their approach to teacher training, content development and distribution, and infrastructure. Various ICT-based projects and programs are also discussed.

Kozma, R. (ed.) (in press). *ICT policies and education transformation*. Paris: UNESCO.

This edited volume includes an introductory chapter on the social and economic drivers of education reform and on a framework for developing ICT policies that support education reform in the service of social and economic development. The book goes on to present ICT policy case studies of five countries: Jordan, Namibia, Rwanda, Singapore, and Uruguay. This is followed by a final chapter that does a cross-case analysis with implications for ICT policy making.

Tjeerd, P., Anderson, R., Law, N., and Quale, A. (eds.) (2009). *Cross-national information communication technology: Policies and practices in education* (second edition). Charlotte, NC: Information Age Publishing.

This is a comprehensive collection of education ICT policy case studies, written by researchers from each of 37 countries in North America, Latin America, Europe, Africa, and Asia. Each case study uses a standard format that includes the structure of the education system, ICT policies and practices, and special issues. In addition, there is an introductory chapter and two cross-case analyses, one that looks at curriculum and staff development and another that looks at infrastructure.

UNESCO (2008). *UNESCO ICT Competency Standards for Teachers*. Paris: UNESCO.

This is a set of three short modules that present a policy framework, the competency standards, and implementation guidelines. The framework and competencies address not only ICT but other aspects of the education context, including teacher professional development, pedagogy, curriculum, assessment, and school organization.

### ***Resources on ICT Policy and Programs in Developing Countries***

International Institute for Communication and Development (2007). *ICTs for education: Impact and lessons learned from IICD-supported activities*. The Hague: IICD.

This practical book is focused on grass-roots ICT projects in education in developing countries in Latin America and Africa. The book describes 32 projects that this NGO has supported, along with lessons learned to provide the reader with ideas for how ICT can be applied to support sustained, equitable growth.

Unwin, T. (ed.) (2009). *ICT4D: Information and communication technology for development*. Cambridge, UK: Cambridge University Press.

This edited volume includes chapters on a variety of ways that ICT can support development. Education is a key focus as a catalyst for development. But chapters also describe how ICT can support health, government, and rural development. Chapters also discuss appropriate technologies for development, review ICT practices, and discuss implications for policies and partnerships.

### ***International ICT Studies***

Law, N., Plegum, W., & Plomp, T. (2008). *Pedagogy and ICT use in schools around the world: Findings from the IEA SITES 2006 study*. Hong Kong: Comparative Education Research Center, University of Hong Kong.

This IEA-sponsored study, examines the use of ICT in schools and classrooms, as determined through interviews of school principals, technology coordinators, and teachers of mathematics and science in a sample of schools in each of the 22 participating education systems in North America, Latin America, Europe, Africa, and Asia. The study includes national policy contexts, school resources, ICT-based pedagogical practices in mathematics and science, and teacher characteristics that affect these practices.

Centre for Educational Research and Innovation (2010). *Are the new millennium learners making the grade?: Technology use and educational performance in PISA*. Paris: OECD.

This study is based on results from 25 OECD countries and 14 partner countries which participated in the PISA 2006 assessment and distributed the student ICT questionnaire along with the assessment. The questionnaire asked students about personal characteristics, as well as their access to, familiarity with, and use of computers and the internet at home and at school. The combination of the questionnaire and the assessment allowed researchers to examine the relationships characteristics, ICT use, and performance on the PISA assessment.

## ***For the General Audience***

Collins, A. and Halverson, R. (2009). *Rethinking education in the age of technology: The digital revolution and schooling in America*. New York: Teachers College Press.

The author challenges the reader to rethink the function and structure of education in a world surrounded by technology. It examines the implications of this phenomenon for pedagogy, content, assessment, location, culture, and relationships and argues for the need for a fundamental transformation of the education system. While focused on the U.S. education system and an American audience, the book has implications for anyone concerned about the future of education in the modern world.

Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future*. New York: Teachers College Press.

This book examines the state of education in the U.S. and the increasing inequality of the country's education system, as documented by the author. Implications are discussed for policies, particularly those related to assessment, accountability, and the financing of education. Again, this book is focused on the U.S. education system and an American audience but it does so within a global context and it references educational policies in several high-performing countries. Both this feature and the general concerns raised in the book make it relevant reading for anyone concerned about education policy.

## **About the Author**



**Dr. Robert Kozma** is Principal Consultant with Kozmalone Consulting. After many years in academia and research with many publications, Dr. Kozma is now an independent operating out of San Francisco, California. He works with government, non-government, and commercial clients on policies, strategies, and programs that connect the use of technology with education reform and economic and social development. His clients have included education agencies in Jordan, Egypt, Chile, Singapore, India, Norway, and Thailand, as well as the World Bank, UNESCO, OECD, the Ford Foundation, Intel, Microsoft, Hewlett Packard and Cisco.

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