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Strengthening the Textbook Production Chain in Morocco: Study Conclusions and Recommendations Appendix B: A Review of the Domain of Electronic Textbooks

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Strengthening the Textbook Production Chain in Morocco: Study Conclusions and Recommendations
Appendix B: A Review of the Domain of Electronic Textbooks

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1 INTRODUCTION

This overview of the challenges and opportunities of school-based digital teaching and learning is intended to provide a framework for policymakers in Morocco who are considering further investments in information and communication technology (ICT) for learning in government schools. Specifically, it addresses the area of digital textbooks. The overview poses questions that policymakers should ask and provides examples of how other countries have responded to such questions.

The document has been prepared as a supplement to the main study of textbook policy issues and recommendations (*Strengthening the Textbook Production Chain in Morocco: Study Findings and Recommendations*).

This portion of the document references a wide range of international commentators and activities. Policymakers will benefit from studying the experiences of other countries in order to arrive at questions that will lead to progress and to determine beneficial starting points.

After reading this overview, the reader may have more questions than answers, which should be considered a positive outcome. Asking the right questions leads to well-targeted actions.

1.1 The objectives, focus, and methodology of this survey

For practical purposes, this overview confines itself largely to textbook-type digital learning materials (rather than web-based learning resources, interactive white boards, or visualizers,[1] all of which can play a valuable role in the classroom). Nor does it examine the wider issues of a digital learning environment, including student assessment and classroom- and school-management systems.

The majority of the authors' fieldwork in Morocco was focused on the "textbook chain"—i.e., the development, evaluation, financing, purchase, and delivery of traditional printed textbooks within an established system. When considering digital textbooks, each of these links in the textbook chain has been taken into account.

The survey aims to be as practical as possible and proposes an intervention based on textbook-type content that is adaptable for the type of ICT infrastructure already available in many of Morocco's lower and upper secondary as well as in some of its primary schools.

1.2 The structure of the survey

The survey begins with the premise that good ICT interventions result from good rationales. It then examines various aspects and issues that need to be addressed when planning such interventions, with reference to relevant international contexts. Finally it proposes a basis for making an appropriate intervention in government schools.

While the other sections of this report have made recommendations at each stage of the document, this survey—which does not address overall ICT in education policy so much

[1] Visualizers are simple camera-projectors that enable the teacher to project the pages of a book, or a worked example, or a simple scientific experiment, onto a (non-digital) white board.

as specific activities—places all recommendations at the end of the report. In fact, the recommendations are set out as a series of recommended activities.

2 THE CONTEXT

Like all ICT decision makers, the Ministry of Education (MoE) in Morocco has faced criticisms from the media, based on global indicators. Reports from advanced digital societies—as well as from neighboring countries—have inevitably put pressure on policymakers across the region to take appropriate action.[2] In Morocco, such pressures have perhaps been exacerbated, rather than moderated, by the experience of the GENIE program, where evidence suggests that the ambitions of the program have not met all expectations.

Two phases of GENIE have been implemented since 2005–2006 and a third is currently underway. The initiative aims at rolling out ICT infrastructure across the country, with four components:

- Infrastructure: installation of Internet-connected multimedia environments
- Teacher training, via modules for inspectors, principals, and teachers
- Acquisition of digital resources and creation of a digital resources national laboratory and national ICT portal
- Provision of support to users

This review will not attempt to assess the success (or otherwise) of these four components.

The current national ICT strategy was set out in 2009, in a document entitled *Maroc Numérique 2013: Stratégie Nationale pour la Société de l'Information et de l'Économie Numérique [Digital Marocco 2013: National Strategy for the Information and Digital Economy Society]*. The strategy indicated a focus on infrastructure:

- An information- and knowledge-based society can only develop when its youth are able to master its technologies at an early age. The computer and the Internet are powerful learning tools, as well as being vehicles for rapid human, economic, and social development.
- Internationally, interventions aimed at providing students with computers are increasing with demonstrable effectiveness.
- To stimulate the provision of computers to education managers as well as their use of the Internet, the government of Morocco will establish a flagship activity to subsidize equipping students in engineering and related fields with laptops and Internet access.
- This initiative will operate alongside the GENIE program, which equips public schools, and the Nafid@ initiative, which subsidizes laptops and Internet

[2] For Tunisia, see Marzouk, H. (2015 April). Tunisie – Engseignement : Des tablettes remplaceront les cartables [Tunisia – Learning: Tablets will replace school satchels]. Online edition of *L'Économiste maghrébin* (posted April 15, 2015). Available at: http://www.leconomistemaghrebin.com/2015/04/15/tunisie-enseignement-des-tablettes-remplaceront-les-cartables/

connections for teachers, launched in September 2005 and May 2008 respectively.[3]

One of the challenging aspects of content and learning concerns the Arabization of Internet content. It is not clear whether *Maroc Numérique*—which echoes similar ambitions by other Arab countries—has had any impact on the creation or adaptation of content. In addition, the government must also consider the 2014 evaluation of the digital strategy above by the Court of Auditors (the approximate equivalent of the office of the Comptroller General in the USA) with regard to GENIE.[4] The auditor's report suggested that an open source methodology (such as that followed in France, Canada, and Switzerland) would be appropriate (see Annex B-1 on Open Educational Resources [OER]). However, these three countries do not operate a textbook approval system. If the expectation is that digital content is to be developed in conformity with the national textbook policy, then it follows that it would also require approval, as is the case with printed materials.

An interesting small-scale initiative has been implemented in the non-formal sector by the Zakoura Foundation, which has adapted the content provided via the GENIE program.

3 WHAT DO WE NEED TO KNOW IN ORDER TO MAKE A CHANGE?

3.1 How does educational change happen?

GENIE can be described as a top-down, rather than a bottom-up, strategy. A top-down strategy consists of providing inputs with the expectation that the inputs will lead naturally to changes. A bottom-up strategy might study what is possible and desirable within the context of traditional classroom practice, and then develop and provide the appropriate technological support to enable such changes to happen.

Many international ICT initiatives are based on an assumption that the introduction of technology into the classroom will, in itself, be transformational. This assumption is the result of observations of other sectors of the economy and society. The potential impact

[3] [Original quote]:

- La société de l'information et de la connaissance ne se développera que si les jeunes générations acquièrent tôt la maîtrise des technologies. Et l'ordinateur comme Internet sont des outils éducatifs puissants, vecteurs d'accélération du développement humain, économique et social.
- Les actions visant à équiper les élèves et étudiants en ordinateurs se multiplient au niveau international et l'efficacité de ces actions est démontrée.
- Pour stimuler l'équipement en ordinateurs et l'utilisation d'Internet par les acteurs de l'enseignement, le gouvernement marocain mettra en place une action-phare d'équipement subventionné des élèves ingénieurs et assimilés en ordinateurs portables avec accès à Internet.
- Cette initiative viendra s'ajouter au programme Génie d'équipement des établissements de l'enseignement public et à l'opération Nafid@ de subvention de l'équipement des enseignants en ordinateurs portables et connexions Internet, respectivement lancés en septembre 2005 et mai 2008.

[4] http://www.courdescomptes.ma/upload/MoDUle_20/File_20_137.pdf. For the full report see http://www.fondationmarocnumerique.org/download/Evaluation-MN13.pdf (which includes detailed responses by MoE).

of ICT in the classroom is sometimes compared with the world of mobile telephony, in which some sub-Saharan countries were able to achieve a "leap-frog" effect from a weak infrastructure base to near-universal mobile phone usage. However, such comparisons can be misleading. Digital classrooms—even where the infrastructure (reliable power, adequate hardware and software, and good maintenance) is available—do not lead to a digital leap forward in educational terms. Classrooms are complex arenas of well-rehearsed practices that do not respond quickly to change.

Therefore, the starting point for change is classroom pedagogy and the relationship between teacher and learner.

3.2 The rationale for change

Policymakers looking at options in the digital terrain may instinctively want to begin by asking *How?, What?,* and *How much?* These questions may seem easier because the answers appear to be concrete and direct. However, a more useful starting point is to ask *Why?* Asking "why" does not imply a reluctance to embrace change. Instead, it emphasizes the importance of clarifying in advance the rationale for investing a large amount of time and resources.

Asking "why" is difficult but necessary. A valuable case study in this regard is Turkey's large-scale (US$8 billion) FATIH initiative. Launched in 2011, the Turkish Ministry of National Education (MNE) sought to provide more than 11 million tablets, pre-loaded with content, for all students as well as interactive white boards for all classrooms (more than 450,000), all within three years. According to World Bank specialist Mike Trucano, FATIH is "one of the largest national initiatives of this sort" that is "largely unknown outside that country's borders." The initiative is an example of a "large-scale, one-to-one[5] educational technology program"; these types of programs can also be found in countries such as Rwanda, Kenya, Uruguay, and Peru.

The FATIH project is also an example of a large-scale ICT investment that lacked a clear rationale. In a 2013 analysis entitled *Turkey's FATIH Project: A plan to conquer the digital divide, or a technological leap of faith?,* specialists from RTI, in collaboration with the Turkish organization Education Reform Initiative (ERI), analyzed the reasons for the apparently limited success of such a large investment.[6] The authors concluded that such projects should have "a broad vision of the purpose of the technology, the expected outcomes, and the logic model that will lead to those expected outcome, even if it is one that espouses self-taught, independent learners, disconnected from the national curriculum. This vision is currently lacking in FATIH."[7]

The RTI analysis proposed that good rationales for large-scale ICT-based initiatives can be grouped under four overall headings:

- Political: that is, educational policymaking being driven by broader imperatives
- Economic: including providing support to local ICT development and manufacture

[5] A one-to-one technology program can be defined as a program in which each child has a device—laptop, netbook, tablet, etc.
[6] See RTI. (2013). *Turkey's FATIH Project: A plan to conquer the digital divide, or a technological leap of faith?* http://www.rti.org/sites/default/files/resources/fatih_report_eri-rti_dec13.pdf
The study was carried out two years after the MNE had already distributed 63,000 tablets, as well as interactive white boards to 84,000 classrooms.
[7] RTI. (2013). p12.

- Social: including addressing the "digital divide" between sections of the population that already have access to ICT at home and those that do not
- Educational: to transform the process of teaching and learning and improve learning outcomes. In other words, as one of our respondents put it, "How can technology enhance learning?"[8]

The authors noted that "It is not really clear whether the focus is on economic, social, political or educational transformation; and if the latter, what specific aspect of educational transformation would be expected."[9] The analysis went on to report that "Other large-scale one-to-one educational technology programs have explicitly cited societal transformation and civic engagement as a goal (in Peru and Uruguay, respectively), and some report that the mere presence of the technology improves social morale as a positive symbol of 'modern' opportunity and progress (Haiti, Peru)." However, "FATIH was conceived without prior demand from within the education system or among parents, the costs of the project are very large, and the potential for failure is significant."[10]

> "Numerous other studies, including the One Laptop Per Child (OLPC) program in Peru, note that for technology to make a difference it must be integrated with specific teaching and learning goals in mind, and accompanied by an implementation model that is practical and incentivizing to allow these goals to materialize.
>
> There is a counterargument popular among advocates of OLPC programs that focusing on distribution first and the implementation model second is a completely appropriate deployment model since children can learn a lot very quickly on their own. Teacher training programs, following this logic, should be tailored around real demands and needs exhibited by children using the technology, and not based on expectations on what will or should happen with it once deployed. However, evidence of failures abound in contexts where hardware was the primary—or only—input, while positive evidence of self-taught students remain largely anecdotal."[11]

While the FATIH project was a large-scale implementation and the RTI study was carried out two years after the project had started, the project nevertheless provides valuable lessons for policymakers in Morocco.

Morocco's *Vision Stratégique 2015–2030* provides a valuable definition of what ICT means within the strategy (see Annex B-2):[12]

"The integration of education technology aims to:

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[8] Rita El Kadiri, *Directrice Générale Développement et Partenariats*, *Fondation Zakoura*. Personal interview with authors, July 2016.
[9] The authors of the FATIH analysis report an MNE official saying, "We are not determining which technology best fits specified education goals, it's the other way around; we are trying to make education fit the given technology."
[10] RTI. (2013). p7
[11] RTI. (2013). p12.
[12] Royaume du Maroc: Conseil Supérieur de l'Éducation, de la Formation et de la Recherche Scientifique. (2015). *Vision Stratégique de la Réforme 2015-2030: Pour une école de l'egalité de la qualité et de la promotion*. Rabat: Conseil Supérieur de l'Éducation, de la Formation et de la Recherche Scientifique.

- Improve the quality of education and training by enabling the acquisition of knowledge, by improving the motivation of the learner, and by making school a more attractive option;
- Qualify the learner to take his/her place in a knowledge society, to master the strategies of distance learning, and to develop personal projects based on research and innovation;
- Streamline education management via integrated information systems;
- Create networks of exchange, sharing, and development of collective knowledge and support for pedagogical teamwork;
- Involve and help pedagogical actors in remote areas."[13]

In attempting to answer the question of how technology can enhance learning, it is mainly the first of the above items that needs to be addressed. This item consists of two essential elements:

- The acquisition of knowledge
- Motivating the learner and making school more attractive

The rationale for a new initiative based on new digital textbooks might therefore focus on improved teaching and learning as well as the expected greater motivation of the students. The experience of the Zakoura Foundation has shown that even students who come from the kind of challenging backgrounds typically found in the project's non-formal schools are keen to attend a school with a digital learning environment. Given the potential for ICT in education to motivate reluctant students in early teenage years, Morocco's determination to address the problems of drop-outs is one of the priorities for attention when considering the form of the intervention.

The rationale may include testing the capacity of the private sector to provide appropriate content, on time and at an appropriate price. Such a rationale can be seen within the context of the textbook policy, which was reformed in 2002 in order to separate the concept of the textbook from that of the curriculum, as well as improve the quality of teaching and learning within the context of support for a public-private partnership with the publishers, which was stated as a priority by the National Charter.

All rationales should be included in any pilot based on introducing new digital textbooks, and these pilots' impacts should be evaluated.

[13] [Original quote]: L'intégration des technologies éducatives a pour objectif :

- d'élever la qualité de l'éducation et de la formation en facilitant l'acquisition des connaissances, en motivant davantage l'apprenant et en renforçant l'attractivité de l'École ;
- de qualifier l'apprenant à accéder à la société du savoir, à maîtriser les stratégies de l'enseignement à distance et à construire les projets personnels au niveau de la recherche et de l'innovation ;
- de rationnaliser la gouvernance éducative en s'appuyant sur des systèmes d'information intégrés ;
- de créer des réseaux d'échange, de partage et développement de l'intelligence collective et d'appui au travail pédagogique d'équipe ;
- d'impliquer et d'aider les acteurs pédagogiques des zones enclavées.

3.3 Refining the focus

Although continuous technological advances mean that new options are always emerging, policymakers in 2016 have the benefit of being able to study a wide range of international experiences. Several international overviews are also available, which can help today's policymakers to avoid the errors of their predecessors. Mike Trucano, of the World Bank, addressed these errors in what he called the "myths of going digital":[14]

- ***"We will cut costs by going digital."*** This is particularly the case where the infrastructure is not yet in place. In countries with weak infrastructure in sub-Saharan Africa, the cost of providing digital reading materials as opposed to print materials was calculated as being between 20 to 60 times more expensive. Obviously costs can be controlled much better than this, but the risks of spiraling costs are evident.[15]
- ***"The content we need is already available—and free."*** In English- or French-speaking environments, there is sometimes a temptation to think that there is plenty of free content, especially for students in secondary schools. In Arabic language contexts, this is clearly less of an issue.
- ***"If we don't act now, we will fall behind."*** This translates into the "political imperative" identified by the authors of RTI's FATIH study.
- ***"Digital learning materials will engage and motivate our children."*** Trucano express it thus: "Some content may motivate learners and some approaches to the use of this content by teachers may motivate learners—and others may not." Examples are provided below of initiatives in which so-called "digital textbooks" add very little that the printed textbooks do not.
- ***"E-books can simply replace textbooks."*** There have been no examples to date in which systems have moved entirely to digital. Even those countries that have taken the lead in moving to "digital only" have taken a step back. For most countries with good digital resources, teaching and learning uses both printed and digital materials. This therefore relates to Trucano's first point regarding the potential of digital resources to save costs. They generally cannot and do not.

3.4 What kind of change can we expect?

(The evidence for the impact of digital resources on teaching and learning)

In a widely reported survey entitled *Students, computers and learning: Making the connection* (October 2015)[16] the Organisation for Economic Co-operation and Development (OECD) provided "a first-of-its-kind internationally comparative analysis of the digital skills that students have acquired, and of the learning environments designed

[14] Fredriksen, B. & Brar, S. (with Trucano, M.). (2015). *Getting textbooks to every child in sub-Saharan Africa: Strategies for addressing the high cost and low availability problem*. Directions in Development. Washington, DC: World Bank. Available at: https://openknowledge.worldbank.org/handle/10986/21876

[15] See *Global Book Fund Feasibility Study: Draft Final Report* (Results for Development Institute, 2016), p30.

[16] OECD. (2015). *Students, computers and learning: Making the connection*. Paris: OECD Publishing. Available at: http://www.oecd-ilibrary.org/docserver/download/9815021e.pdf?expires=1469206689&id=id&accname=guest&checksum=95F36D5B4E8BCAA46BDCA80AF9ED3721

to develop these skills." The OECD analysis compared data from 15-year-old students in member countries and posed critical questions as to what benefits might be expected from digital learning and attempts to analyze why the expected benefits do not always occur. Although the OECD study included all aspects of the use computers in education, the findings are important for a study of what to expect from investment in digital textbooks. Improved learning outcomes, even in the relatively high-income systems of OECD member countries, are clearly marginal. This is even before the high costs of such investments are taken into account.

Among the most widely reported findings of the report was that there were "no appreciable improvements in student achievement in reading, mathematics or science in the countries that had invested heavily in ICT for education. And perhaps the most disappointing finding of the report is that technology is of little help in bridging the skills divide between advantaged and disadvantaged students."[17]

RTI's own study of the evidence to support investment in ICT[18] in education, prepared in January 2015 for the government of Nepal as a background study for a planned Early Grade Reading Project (EGRP),[19] argued the following points:

- Technology has the most impact when school systems are already strong.
- Technology works best when it is applied with purpose to support very specific instructional goals.
- Teachers have to be in the driver's seat.

In their influential meta-study of hundreds of peer-reviewed education researches, Hattie and Yates[20] dug deeper into the possible conditions required for digital learning (or computer-based learning) to lead to improved learning outcomes. Their meta-study found the following:

- Effects were stronger when computers were used to supplement traditional teaching, rather than being seen as an alternative.
- Effects were stronger when teachers received higher levels of training in the use of computers.
- Effects were strong when computers offered students opportunities to extend their learning practice periods or take advantage of tutorial assistance.
- There were clear advantages in the students assuming control over the learning situation in aspects such as pacing and mastering new material.
- Students were able to use computers most effectively when working in pairs.
- Computers have the ability to provide highly adaptive feedback to the learner.
- Students learn more when they work in pairs using technology.

[17] OECD. (2015). p3.
[18] Defined in the Nepal study as "electronic devices including, but not necessarily limited to: desktop, laptop, or tablet computers; mobile phones; and projection devices that can be used with or without Internet or telephone/Internet data connections."
[19] *ICT in Education – Talking Points Prepared for Nepal EGRP*, by Sarah Pouzevara and the ICT4E&T Team.
[20] Hattie, J. & Yates, G. (2014). *Visible learning and the science of how we learn*. New York: Routledge.

The general lesson from the OECD survey and from Hattie and Yates' meta-study is that digital teaching and learning does not by itself have a revolutionary impact. Instead, it tends to reinforce or "amplify" existing practices. This is sometimes described as "the amplifier effect." Good learning practices—such as extended learning, good pacing and mastery, pair-work, and good feedback—can be strengthened by the integration of digital learning within traditional (textbook-based) learning.

An even more recent meta-study found that "The evidence on the impact of greater use of technology in the classroom is mixed, and program impacts seem to depend crucially on the details of both the intervention and its implementation. In particular, it appears that the key success factor is the extent to which careful thought goes into integrating effective pedagogical techniques with technology. Much more, and much more careful, research is needed (on both process and impacts) before committing resources to scaling up these programs—especially those involving expensive investments in hardware—with scarce public funds."[21]

On the other hand, several studies have found that the affective impact of classroom technology is often greater than the cognitive. The authors of a wide-ranging meta-study of 26 researches into the effects of digital textbooks on learning concluded that "Given the importance of affective learning and especially the role of motivation in learning, our findings indicate that digital textbooks can work as an effective facilitator for learning."[22]

The above arguments are not intended to suggest that investment in ICT for education is generally misdirected, or that it will usually have little impact. This paper puts forward the view that good investment comes from good rationales and from well-targeted interventions, based on specific teaching and learning practices. The authors purport that, taking Hattie and Yates' findings above, the most important criteria are as follows:

- Digital teaching supplements and supports traditional teaching.
- Teachers require adequate training
- There should be opportunities for students (especially in the lower and upper secondary cycles) to extend their own learning.

4 DIGITAL CONTENT

Having identified that pedagogy should be at the heart of a digital intervention, the content of the digital textbooks is critical.

[21] Glewwe, P. & Muralidharan, K. (2015). *Improving school education outcomes in developing countries: Evidence, knowledge gaps, and policy implications*. Research on Improving Systems of Education (RISE) Working Paper 15/001. Available at: http://www.riseprogramme.org/sites/www.rise.ox.ac.uk/files/RISE_WP-001_Glewwe_Muralidharan.pdf

[22] Jang, D., Yi, P., & Shin, I. (2016). Examining the effectiveness of digital textbook use on students' learning outcomes in South Korea: A meta-analysis. *The Asia-Pacific Education Researcher, 25*(1), pp 57–68. The authors went on to add, "Considering Korean students' low score on affective domain such as motivation, interests, self-concept, and self- efficacy in international comparative student assessment like PISA (OECD 2013), the motivational effect of digital textbooks is good news. Educators and practitioners will be able to utilize [digital textbooks] as an instructional tool to increase motivation of students."

4.1 Digital and print

A myth that Mike Trucano did not address was that digital textbooks will replace traditional textbooks. In fact, many advocates for digital textbook interventions believe the following:

- There will be cost savings because printed books—which have relatively short lives—will no longer need to be purchased.
- School bags will become lighter, thereby reducing the risks to children's health.
- A fully integrated school-based and system-based learning and assessment system can be developed, providing a real-time picture of all learners' progress.

However, all the evidence suggests that for most education systems—at least for the foreseeable future—digital resources will be used *alongside* traditional printed resources in what is often described as "blended learning." According to a recent review of schools' use of e-books in the US, "all insist that a blend of print and digital content is the current standard in classrooms and school libraries, and is likely to remain so for a long time."[23]

In fact, initiatives that have attempted to replace the textbook have often created confusion. In his 2015 report, *Where have all the textbooks gone?*,[24] international textbook and learning specialist Tony Read referred to Jordan's experience of developing digital textbooks: "…the e-materials developers perceive e-materials as a replacement for, rather than as supplementary to, existing textbooks and teaching and learning strategies, with which a majority of Jordanian teachers are familiar and comfortable." The result was that "There was no evidence of a detailed, well-coordinated needs analysis intended to provide an integrated approach to the development and provision of teaching and learning materials in both print and e-formats." [25]

Blended learning may have several rationales. For many years, South Korea has pioneered the use of e-textbooks. Some years ago it announced that by 2015, the country's schools would switch *entirely* to digital materials. In 2012, the government decided to scale back the implementation. Students in grades 3 and above would use a *mixture* of digital and printed materials. Meanwhile, the government is studying the social and health issues, as well as the infrastructure and educational outcomes.[26] A recent analysis found that "the government's ambitious and speedy implementation plan has been criticized for its lack of systematic examination of its impact on classroom teaching and learning practice. It is still unclear how effective digital textbooks are in teaching which subjects in which grades and whether students' achievements, attitudes, and/or

[23] Maughan, S. (2015 August). School and library spotlight: How schools buy and use e-books. Online version of *Publishers Weekly*, August 28, 2015. Available at: http://www.publishersweekly.com/pw/by-topic/industry-news/libraries/article/67927-school-and-library-spotlight-how-schools-buy-and-use-e-books.html

[24] Read, T. (2015). *Where have all the textbooks gone? Toward sustainable provision of teaching and learning materials in sub-Saharan Africa*. Directions in Development. Washington, DC: World Bank. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/22123/9781464805721.pdf?sequence=1&isAllowed=y

[25] Read, T. (2015). pp 255–256.

[26] Kim, K. & Jo, S. (2014). Korean schools are getting SMART. Online version of *Korea JoongAng Daily*. (June 14, 2014). Available at: (http://koreajoongangdaily.joins.com/news/article/article.aspx?aid=2990585

motivation are improved by digital textbook use."[27] Implementation is now expected to be delayed until 2018.[28]

In a 2014 online survey in France of more than 15,000 teachers across all school cycles, it was found that digital textbooks were better at providing content and much better at stimulating learners' interests, but—perhaps surprisingly—they did not appear to provide much support in terms of individual learning, remediation, or evaluation. Although the majority of teachers saw the e-textbooks as essential, 85% saw the digital medium as an additional resource alongside the printed textbook.[29]

It appears to be the case also in Morocco that the students who have already been exposed to ICT-based learning prefer a blended approach.[30]

Blended learning places even greater demands on teachers' time in an environment where most teachers—and inspectors—believe that the entire textbook must be taught in order to "cover" the syllabus.

The Auditor General's report (2014) found that "The initial objective of the GENIE program in terms of using information technology is a long way from being realized since the average use by the student (apart from those schools where the rooms are totally enclosed) is only around 18 minutes per week in the primary, middle school, and upper secondary cycles. This amount is below the intended levels of one hour, two hours, and three hours for each cycle respectively."[31]

4.2 The form and quality of content

In the typical classroom environment of Morocco, the textbook is the framework for teaching and learning. Given this constraint, and the limited flexibility of the teaching timetable, digital resources will probably need to be organized similar to textbooks and will need to provide enrichment of the textbook in a "blended" approach. Such an approach may be implemented with or without students being provided with devices on a one-to-one basis. (See Section 4.3.)

Although the digital terrain is full of challenges, perhaps the most difficult challenge of any ICT intervention is ensuring high-quality content. Examples can be found in many countries of high-tech hardware delivering very "low-tech" content.

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[27] Jang, D., Yi, P., & Shin, I. (2016).

[28] Kim, J. (2016). South Korean students to get digital textbooks by 2018.Online edition of *Koogle TV* (July 18, 2016). Available at: http://www.koogle.tv/media/news/south-korean-students-to-get-digital-textbooks-by-2018/

[29] TNS Sofres. (2014). *Les usages des manuels numériques en 2014 : Principales évolutions depuis 2011*. Savoir Livre. Available at: http://www.tns-sofres.com/sites/default/files/2014.10.03-manuels-numeriques.pdf

[30] Nazih, A. (2016). TIC à l'école : Gros efforts, avec les moyens du bord. Online edition of *L'Économiste* (May 4, 2016). Available at: http://www.leconomiste.com/article/996090-tic-l-ecole

[31] Auditor General, Morocco. (n.d.). *Évaluation de la stratégie Maroc Numéric 2013 : Synthèse*. p11. Available at: http://www.courdescomptes.ma/upload/MoDUle_20/File_20_137.pdf.
[Original quote]: L'objectif initial du programme GENIE en matière d'utilisation de l'outil informatique est loin d'être atteint du fait que la durée moyenne d'utilisation par élève (hors élèves des établissements dont les salles sont totalement fermées) n'est que de 18 mn par semaine environ pour le cycle primaire, le cycle collégial et le cycle qualifiant. Ce taux est en deçà des objectifs arrêtés qui sont respectivement de 1 heure, 2 heures et 3 heures pour les trois cycles.

In Jordan's Education Reform for the Knowledge Economy (ERFKE), launched in 2008, the new electronic textbooks were merely e-pdfs that had the normal functions of a pdf file, including search facility and the possibility of making notes.

The first step for many ministries of education worldwide has been to place their textbooks online in a basic pdf format. For example, starting in 2002, Malaysia's "Education Blueprint" at first made its textbooks available electronically over the Ministry of Education portal as a pdf that could be searched and annotated.[32] However, for the second phase (2016–2020), Malaysia's MoE is producing interactive textbooks for selected subjects, containing audio-visual and animation.[33]

An example of the types of functions and uses that e-textbooks might have can be found in a 2015 study of teachers' attitudes in Taiwan, self-described as "the first study to report findings regarding teacher perceptions of e-textbooks in Taiwan." Because Taiwan's system of approved textbooks is comparable to that of Morocco, the findings are valuable. The researchers grouped their findings into three requirements:

- e-textbooks should be approved in the same way as print textbooks.
- e-textbooks should have not only textbook contents but also digitalized assessments or teaching materials such as assignments and academic records.
- e-textbooks should have multimedia presentation functions to help the students learn.[34][35]

Referring once again to the three criteria that we identified in Hattie's list above, we may think of the content of e-textbooks, in terms of both teaching *and* learning, as follows:

- Function for the teacher: supporting traditional teaching with the addition of photos, animations, simulations, videos, audio, and other resources, including Classroom Response Systems (classroom communication systems, or voting machines)
- Function for the student: highlighting, annotating, searching, bookmarking, referring, and editing

In addition, as the Zakoura Foundation has already tested, background material for teachers and students can also be provided (a *bibliothèque numérique*, as Zakoura describes it).

As Morocco's *Vision Stratégique* puts it, the digital content must "encourage the initiative of the learner and develop his/her autonomy and understanding in a digital age where knowledge takes many forms."[36]

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[32] Farhan. (2014). Challenges in implementing digital textbooks in Malaysia. Online editorial on *Lowyat.net* (February 13, 2014). Available at: https://www.lowyat.net/2014/19015/challenges-in-implementing-digital-textbooks-in-malaysia/

[33] Rajaendram, R. (2016). Moving forward with e-Books. Online version of *The Star* (July 3, 2016). Available at: http://www.thestar.com.my/news/education/2016/07/03/moving-forward-with-ebooks/

[34] Lin, Y., Liu, T., & Kinshuk. (2015 January) Research on teachers' needs when using e-textbooks in teaching. *Smart Learning Environments 2*(1). Available at: https://slejournal.springeropen.com/articles/10.1186/s40561-014-0008-1

[35] See Annex B-4 for effective strategies for developing digital textbooks.

[36] *Vision Stratégique de la réforme, 2015–2030*, p13. [Original quote]: …encourage l'initiative de l'apprenant et développe son autonomie et sa perspicacité à l'ère du numérique et de la profusion des connaissances.

4.3 Formats and devices

As support for teachers, textbooks may support whole-class teaching, either by projection using an interactive white board (or "smart board") or via individual devices.

Whole-class teaching models reinforce traditional classroom dynamics, which—as described above—can assist in the teacher's successful adoption of new technologies and content.

Such models might be supported, in classrooms where the infrastructure exists, by one-to-one learning in which each student has his/her own device.

The Zakoura Foundation has recently adopted a one-to-one model in which students earn the right to take the tablet home (for good behavior or academic performance).

One-to-one scenarios allow students to pursue their own learning from time to time within the traditional teacher-led classroom.

4.4 The approval of multiple or sole digital textbooks

Policymakers face similar issues in both the digital domain and the print domain. In a context of government-approved textbooks, such as in Morocco, digital textbooks should be approved in the same way as printed textbooks. Criteria for the content and pedagogy need to be established, to achieve high standards and avoid negative content.

However, the issue of multiple textbooks may need to be addressed differently for digital editions as compared with print editions. The costs associated with the development of digital textbooks will require a specific financial model (see Section 4.8). Such questions have concerned governments in higher-income countries as well as countries of middle to lower income. In France, the MoE at first considered imposing a single textbook title per subject and level (also known as a "sole textbook") on all schools before opting to offer each region the choice of implementing in its own way (with budgets based on 50% from central government and 50% from the region).

4.5 Support for teachers

The success of an ICT intervention will depend on the response of teachers on whom the MoE relies for implementation. In the schools supported by the GENIE program, some of the teachers report not having enough time to carry out their normal tasks while at the same time adding new activities using digital content.[37]

Even countries with higher resources have found that teachers' responses can be less enthusiastic than expected. For example, a well-known study in Finland in 2008 found the following:

> *There is a range of quality and innovative materials available to teachers and schools. But the uptake has been extremely variable. Teachers are using digital technology—for professional and personal communications, for accessing conventional lesson and curriculum materials, and for administrative purposes. But the daily use of digital learning resources by learners and teachers in the classroom could be estimated, on the basis of an*

[37] In the early phase of the GENIE program, this was even more of a challenge because teachers had to move with their students to a computer lab. With the new tablets, the students can remain in the classroom.

overview of self-report data, to occur in no more than a third of classrooms—varying greatly by subject fields and levels.

There is little evidence that digital learning resources have had a major impact on everyday pedagogy—teaching/learning interactional relations between teachers and students. Further, there is very little evidence that digital resources have supplanted print textbooks as the dominant focus of the curriculum to any significant degree. There is no generalizable or system-wide data on the effects of digitalization on student learning. These findings have been triangulated in the limited published data on Finnish schools, and were corroborated by every stakeholder interviewed by the Review team.[38]

The report concluded with the statement that "Teachers and principals, parents, students, and communities need clear answers to questions about 'Why digitalize schooling?', 'What might this look like?', 'To what ends?', and 'With what outcomes for students?'—particularly as governments, educational systems, and technology companies move from a period of economic prosperity and growth to address new, difficult economic conditions."[39]

It seems that the fairly simple approach adopted by the Moroccan-Korean CITI project[40]—which targets ICT-enabled teaching of science at the middle school level—provides useful lessons for working hand in hand with teachers and providing a very accessible format. However, it should also be noted that the pedagogy employed by the CITI approach is very traditional, consisting of slide shows accompanied by limited animations, and supported by multiple-choice assessment questions of a very traditional type. The great number of photographs that support the text might well make the presentations attractive to students, although it is not clear whether the images have all been used with permission.

An instructive example can be found in a case study of a Moroccan teacher of English as a foreign language that reports on a single observed English lesson, during which "ICT practices […] sacrifice pedagogy for the sake of technology threaten teaching and learning practices."[41]

4.6 Social and health issues

The RTI/ERI analysis of the FATIH initiative raised concerns about the health aspects of a large-scale rollout carried out without preliminary studies. (See Annex B-3.)

4.7 The costs

"Countries that have adopted e-books in their education system have support at a federal level because the adoption of e-books in the classroom requires a tremendous

[38] OECD. (2008). *Study on digital learning resources as systemic innovation: Country case study report on Finland*. Available at: http://citi.aui.ma/index.php?option=com_content&task=view&id=218&Itemid=139
[39] OECD. (2008). p19.
[40] http://citi.aui.ma/index.php?option=com_content&task=view&id=278&Itemid=164
[41] Lamtara, S. (2014). Teachers' ICT practices: A case study of a Moroccan EFL teacher. *Arab World English Journal*, 5(4), 398-410. Retrieved from: http://www.awej.org/images/AllIssues/Volume5/Volume5number4Decmber/26.pdf

amount of financial resources, training, and collaboration with many related organizations."[42]

Investments in digital learning, contrary to some expectations, are unlikely—even in the long term—to save money. Digital learning, especially during the initial investment phase, is costly.

Some policymakers are motivated by the potential cost savings of digital learning. However, in many countries where the authors have personal experience, policymakers have not taken a sufficiently informed view of the potential costs and are sometimes seduced by the fact that digital textbooks and other books are often sold online at lower prices than the printed editions.

The costs of investing in an effective, reliable, and sustainable digital strategy are high and must include (a) capital costs, (b) annually recurring operational costs, and (c) infrastructural costs such as teacher training and teacher support costs. These costs must be covered before any investment is made in the learning content itself.

Developing digital content (i.e., before the manufacturing stage) is more expensive than developing content for traditional textbooks. It includes extra copyright fees and expensive video content, as well as the costs of the extra technical skills required inside the publishing organization.[43] Even when manufacturing costs are included—depending on the number of copies of printed textbooks, and in some cases the number of licenses for digital textbooks—the overall extra cost of publishing digital content may be greater than the cost of printing a traditional book, especially in secondary schools where the numbers of printed textbooks are often much smaller and therefore the cost of printing is lower. The only significant savings for a digital textbook is therefore in the delivery cost.

The higher development costs can exclude many potential suppliers from taking part in potential calls for offers. In some countries—Hong Kong for example—the MoE has entered into cost-sharing with suppliers to kick-start the development of digital textbooks. In 2012, the Hong Kong government budgeted HK$50 million (63 million MAD, approximately) for the e-Textbook Market Development Scheme (EMADS), to "facilitate and encourage the participation of potential and aspiring e-textbook developers to develop a diverse range of e-textbooks in line with our local curricula." The intention was to undercut the textbook publishers, whose prices were seen as too high. (In Hong Kong, parents pay for the textbooks.) Therefore the Education Bureau designed the tender to appeal to other organizations and even individuals to submit materials.[44] The materials submitted by the providers had to be adaptable to various devices, including smart phones. Three years later, the average price of the digital textbooks was 30% less

[42] Kim, J. H. (2014). Apple's iBooks author: Potential, pedagogical meanings and iImplementation challenges. In Z. Yang, et al. (Eds.) *Transforming K-12 Classrooms with Digital Technology* (pp. 119-139). P.R. China: Central China Normal University.

[43] One leading Japanese publisher estimated the cost of developing a series of four social studies textbooks as US$100,000: http://www.japantimes.co.jp/news/2015/06/01/reference/e-textbooks-open-digital-can-worms/#.V6XpFjfRP2c. This confirms other publishers' experiences.

[44] It is worth noting that the initial products were not high quality. The situation was similar to that faced in the 1990s when the first generation of CD-ROMs appeared: the traditional publishers lacked the technology while the new technology companies lacked the expertise to develop high-quality learning content.

than the printed editions. However, some digital editions were considerably more expensive [45]

Any pilot initiative, involving a limited number of schools, would clearly require financial support from the MoE, even if the long-term objective was a multiple-digital textbook system in which the finances were able to support a competitive system similar to the one recommended for print textbooks in the main section of this report. Such a system might be based on schools' purchase of licenses for agreed periods of time. Licenses would be limited to multiple users within each school.

5 HOW TO START?

Mike Trucano offers an answer to this question: "Countries considering use of digital teaching and learning materials…for the first time may first wish to target a specific cohort of students and/or subjects. Even where countries have decided to take a 'big bang approach' to the use of digital [teaching and learning materials] across their entire education system (such as the case in the Republic of Korea and Uruguay), [they] typically adopt a phased approach. By limiting initial efforts to a specific subject (e.g., math or science) or grade level (e.g., primary, middle, or secondary school students), ministries of education can make targeted use of scarce resources while at the same time learning how to implement initiatives featuring digital [teaching and learning materials] before expanding them more widely."[46]

Trucano ends with ten recommendations:

1. Take a holistic approach—in terms of overall digital strategy.
2. Pursue complementarity before substitution—e-textbooks will not replace printed textbooks any time soon.
3. Assume change (in technologies, in market participants, in content)—should be flexible.
4. Calculate and budget for total costs over time, not just the upfront costs of content acquisition and the purchasing of devices.
5. Avoid vendor lock in—and try to ensure a diversity of suppliers and supporting ecosystem or actors and partners.
6. Consider that public relations and community outreach campaigns can be crucial to the adoption of new digital teaching and learning materials.
7. Do not neglect training and ongoing support.
8. New competencies, and possibly even new institutions, may need to be developed to help direct and oversee related activities.

[45] Yeung, M. (2015). A matter of publish or perish. Online version of *China Daily Asia* (December 15, 2015). Available at: http://www.chinadailyasia.com/focus/2015-12/15/content_15358688.html

[46] Fredriksen, B. & Brar, S. (with Trucano, M.). (2015). *Getting textbooks to every child in sub-Saharan Africa: Strategies for addressing the high cost and low availability problem*. *Directions in Development*. Washington, DC: World Bank, p. 91. Available at: https://openknowledge.worldbank.org/handle/10986/21876

9. Review existing laws and regulations as they may relate to the use of digital teaching and learning materials.
10. Assess existing procurement processes to ensure that they are appropriate and relevant—and make changes where necessary.

6 RECOMMENDATIONS

The MoE does not have the option of "doing nothing." What it can do is proceed with wisdom and in measured steps, within a limited pilot. It needs to know what it seeks to learn at the outset and at each step. It also needs to know that while it is not possible to predict the outcomes of a pilot, it can be safely assumed that neither the pilot nor the long-term implementation will save money. On the contrary, the government will need to invest at the outset, and then continue to invest.

The following recommendations assume that a pilot can be designed on the basis of infrastructure that is already in place and that is supported by a responsive and knowledgeable technical team to address issues of maintenance, connectivity, and compatibility.

6.1 Establish the rationale

Study in detail the educational rationale for a digital resource initiative. Academic experts, teachers, and senior education directors should all be included in such a study.

Given that the MoE has had several years of experience with the phases of GENIE that have already been implemented, a selection of teachers (perhaps from among the high-performing teachers) who have implemented GENIE should be asked to review the rationale.

The rationale might include the modality of providing opportunities for local providers to develop digital content.

6.2 Study other countries' experiences

Conduct a detailed study of other countries' experiences and, if possible, travel to these countries to meet with policymakers and implementers.[47]

6.3 Design a pilot

A small-scale pilot should be designed, targeted at colleges and/or upper primary grades.[48] Targeting these grades has educational rationale and also supports the MoE's wider objective of addressing school populations that are prone to drop-out. There are also fewer health controversies over excessive use of handheld devices after children reach secondary school.

The pilot should test different environments, including urban and rural.

[47] It is worth noting that the Zakoura Foundation organized a Schools of the Future event highlighting experiences from Turkey and Uruguay.
[48] France's current implementation, starting in 2016–2017, targets the fifth grade, and will then move grade by grade for three years.

The pilot should test not only the practices and outcomes, but also the attitudes and behaviors associated with the introduction of the new methods.

Policymakers should "think pilot." An article in *Wired* online newsletter reports, "According to [Eric] Warschauer, the transition to tablet textbooks may be inevitable; as hardware prices drop, advantages of cost and convenience will be far more clearly defined than their superiority as educational tools. During the transition, he recommends that experiments and studies be conducted to determine how tablets best enable learning. In the meantime, schools don't need to rush."[49]

A pilot will provide a chance to test relationships between teacher and learner, between learner and text, and between government and the private sector.

6.4 Technical support for the pilot

It is assumed that the GENIE program can provide the technical expertise.

In addition, the MoE should create a small research team to lead the pilot, consisting of education specialists as well as technical experts. Government might also consider including an independent institution to evaluate the results of the pilot, to avoid possible bias in interpreting the results.

6.5 Design an awareness campaign

The MoE will need to design an awareness strategy that emphasizes the rationale and the process. This will be necessary for all stakeholders, including publishers who will need to understand that the e-textbook procurement method for the pilot, in which a single e-textbook will be approved for the purposes of the pilot, is not a preparation for reverting to a "sole textbook" policy.

6.6 Design an appropriately funded and timed public-private partnership

The development of digital materials takes longer than the development of printed textbooks. For suppliers in Morocco, it will be a steep learning curve.

The MoE should approach the procurement of the digital content in the same way that the main section of this report recommends for printed content, via a two-stage process:

- First, invite providers to submit proposals. The proposals should be demanding in terms of concept development and technical references but should not demand a huge investment in new content. The purpose is to select proposals that demonstrate how the digital content enriches the learning experience, not simply transferring the learning experience from paper to screen. The content must be comprehensive. Teachers should be able to decide whether to use the digital or the print content (or both) at any time during the year.
- The second stage will include reviewing the content in terms of coverage and pedagogy, as well as testing it in typical classroom conditions.

[49] Keim, B. (2012). iPad textbooks: Reality less revolutionary than hardware. Online version of *Wired* (January 26, 2012). Available at: http://www.wired.com/2012/01/ipad-textbooks-learning/

6.7 Involve teachers at all stages

Teachers should be involved in testing the materials during the development process and should also be given adequate training before the pilot.

ANNEX B-1: Open Educational Resources (OER)

The most recent development is open source textbooks,[50] developed by the Open University of Hong Kong (HKU).[51] HKU says, "The printed textbooks can be obtained at a low cost, while the electronic versions are provided to teachers and students free of charge"—HK$17.5 of government funding (the Chief Executive's Community Project Fund)[52] and funds obtained from external supporters.

Poland is a useful case study of the possibilities and challenges that arise when government sees the potential of digital learning materials to simplify the process of providing textbooks at the same time as reducing the cost. In Poland, after the fall of the Soviet Union, most parents had to pay for their children's textbooks. A growing public and government reaction has led to government exploring alternatives to the post-Soviet market-oriented system. Other countries in the region, in particular Hungary, have also seen similar developments.[53]

Having already assigning a state distributor with the responsibility for delivering all textbooks to schools, in December 2013 the Hungarian government controversially brought the actual publishing of all primary school textbooks – along with other sectors of the economy – back under government control.[54,55] The textbooks will be provided to students free of charge.

Poland is "the first to introduce a national program for the creation, with public funding, of textbooks that are open educational resources."[56] Poland has a system of subsidizing textbooks for the poorest families, called "School Starting Kit," which can be compared with Morocco's *Un Million de Cartables* initiative.

Poland's open textbook initiative is part of its wider "Digital School" program, which launched in 380 pilot schools in 2012–2013, with free digital textbooks (under a Creative Commons or another open license) for grades 4–6. Schools that participate in the project received an 80% subsidy for the purchase of computer equipment. October 2013, the first modules of Polish open e-textbooks from Cyfrowa Szkoła (Digital School) program were published. "The costs associated with production of the open textbooks are supported by funds previously spent by the government to subsidize the purchase of textbooks for low-income families."[57]

Open-access digital textbooks were introduced in all cycles in school year 2015–2016. The content is developed by Poznan Supercomputing and Networking Center (PSNC), a Poznan-based programing center affiliated with the Institute of Bioorganic Chemistry at

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[50] http://www.opentextbooks.org.hk

[51] http://www.ouhk.edu.hk/wcsprd/Satellite?pagename=OUHK/tcPortalPage2014&CCNAME=CCNEWS&c=C_PAU&cid=1385180081243&dis=11&YEAR=2016&PAGE=1&STU_ANNOUNCE=false&lang=eng

[52] http://www.opentextbooks.org.hk/news/21

[53] See http://fep-fee.eu/The-end-of-educational-book-market

[54] http://www.thebookseller.com/news/hungary-nationalises-textbook-market

[55] http://publishingperspectives.com/2014/02/can-textbook-nationalization-curb-profiteering-publishers/#.V5METjc5G-4

[56] Kamil Śliwowski and Karolina Grodecka, 'Open Educational Resources in Poland: Challenges and Opportunities' (UNESCO Institute for Information Technologies in Education, Moscow, 2013): http://iite.unesco.org/pics/publications/en/files/3214727.pdf

[57] https://www.opensocietyfoundations.org/voices/poland-pioneering-worlds-first-national-open-textbook-program

the Polish Academy of Sciences, in collaboration with several educational publishing houses and universities, including the University of Wroclaw and the Lodz Technical University.[58]

The Polish book sector (publishers and booksellers) resisted the initiative loudly and publishers refused to submit materials for the Digital School initiative.

One analysis of the recent history of textbook policy in Poland says, "There is widespread acceptance for the Government's decisions as the new system seems to be less costly to the citizens. Nothing is known, however, about long-term consequences of these decisions in the fields of economy and education."[59]

Other initiatives similar to Poland's experiment with OER include the Province of Sao Paulo in Brazil and the State of Washington in the USA. Students in South Africa use open textbooks produced by Siyavula Education, an OER technology company.

Further information on OER initiatives can be found in this OECD survey: http://www.oecd.org/innovation/open-educational-resources-9789264247543-en.htm

[58] http://publishingperspectives.com/2015/06/in-poland-the-market-for-digital-textbooks-expands/#.V5NLgjc5G-4

[59] Ewa Jabłońska-Stefanowicz, 'Polish textbook market (1970–2012): Changes and tendencies', http://www.zurnalai.vu.lt/files/journals/51/articles/4009/public/62-76.pdf

ANNEX B-2. Les technologies de l'information et de la communication

(extracted from Vision Stratégique de la Réforme, 2015–2030, pp72-73)

Vu les objectifs fixés par la «stratégie Maroc numérique», qui accorde à l'École un rôle et des fonctions essentiels dans la diffusion des technologies de l'information et de la communication, et en considération des effets induits de l'intégration de ces technologies sur le renouveau et le progrès de l'École marocaine, le Conseil recommande de :

- Élaborer un programme national, qui vise à compléter l'équipement des établissements scolaires, universitaires et de formation en technologies éducatives, en salles multimédia et en équipement audio-visuel, à les connecter au réseau internet et à équiper les bibliothèques scolaires et les structures universitaires d'encadrement et de recherche, en ressources numériques nécessaires.
- Intégrer les technologies de l'information et de la communication à tous les niveaux de la gestion et faciliter l'accès aux données, leur archivage et leur partage, ainsi que l'interactivité et la communication entre les diverses parties impliquées dans la gestion du système.
- Renforcer l'intégration de ces technologies à l'École dans le sens de la promotion de la qualité des apprentissages, notamment :
  - Dans la conception et la préparation des curricula, des programmes, des matières et au cours de leur mise en œuvre ;
  - L'utilisation des logiciels et des ressources numériques interactives dans l'ensemble du processus pédagogique en ciblant l'auto-apprentissage, la recherche et la diversification des sources d'apprentissage ;
  - La révision à moyen terme, du concept de manuel scolaire, en œuvrant pour sa numérisation, ainsi que celle de l'ensemble des documents scolaires ;
  - L'Intégration à moyen terme, des technologies éducatives et de la culture numérique, comme matière principale dans la formation initiale et continue de tous les acteurs pédagogiques ;
  - La formation à moyen terme, des spécialistes dans la conception de logiciels éducatifs et la production de ressources éducatives numériques ;
  - L'incitation des jeunes à la création d'entreprises spécialisées dans la production des ressources éducatives numériques ;
  - La création des centres de ressources numériques aux niveaux régional et local, ainsi que des laboratoires d'innovation et de production de ressources et la formation de spécialistes dans ce domaine ;
  - Le développement et la promotion de l'apprentissage à distance comme complément aux cours en présentiel ;
  - L'élaboration d'un plan d'action pour la sensibilisation à l'importance des technologies de l'information et de la communication et à leur contribution à la réforme de l'École ;

- La promotion de la recherché théorique et pratique dans les domaines de l'éducation et de la formation, en relation avec les technologies de l'information et de la communication ;
- L'ouverture sur les entreprises et les partenaires dans les domaines des technologies de l'information et de la communication, aux niveaux national et international, afin de les inciter à contribuer à l'effort public d'amélioration des infrastructures et des équipements nécessaires ; et ce, dans le cadre de partenariats institutionnels.

ANNEX B-3. Health and Environmental Effects of the FATIH Project

Notably absent from official FATIH documentation has been the issue of e-waste, or what will be done with all of the hardware as it inevitably becomes obsolete or irreparable and has to be disposed of. A May 2012 bylaw by the Ministry of Environment and Urban Planning on the Management of Waste Electrical and Electronic Equipment (WEEE) limits the use of hazardous materials in the manufacture of electrical and electronic equipment; and also sets the framework for recycling electronics and reducing the amount of WEEEs. As per these regulations, manufacturers and importers of electronic equipment are responsible in part for their recycling. The bylaw became fully effective after a year of its published date, therefore it is expected that manufacturers and importers of tablets within the scope of FATIH will comply with these regulations on WEEE. Although this is also an area that could potentially promote some local economic opportunity, it also has the potential to create other economic and environmental burdens, further undermining the return on investment.

Furthermore, the health effects are unknown. It is expected that when the next phase of tablet deployment occurs, the communication between tablet and IWB will require some kind of wireless classroom network, and access to the pedagogical resources will necessitate an Internet connection. We were told anecdotally that because of the pressure to keep the same tablet throughout several years, some children have become over-protective, and reportedly some even sleep with the tablet under their pillow or refuse to go to recess or do sporting activities where they would have to leave their tablets unattended. The effect of such constant exposure to wireless radiation is unknown. While a nascent but growing body of evidence suggests that Wi-Fi radiation levels are generally too low to cause harm, the same cannot be said with much certainty for constant exposure to mobile phone signal radiation, and it is conceivable that while constant Wi-Fi exposure has not been found to be overtly harmful, it is very unlikely to be beneficial.

ANNEX B-4. A Study on the Development of Digital Textbooks: Designing a Prototype of Digital English Textbooks

October 31, 2014[60]

The purpose of this study is to explore strategies of developing digital textbooks in which educational contents, teaching and learning, and educational evaluation are linked with one another. First, this study analyzed the roles and functions of digital textbooks which can enable students conduct self-directed learning activities. Second, this study investigated effective design strategies for linking educational contents, teaching and learning, and educational evaluation with one another through digital textbook. Third, this study developed one prototype of digital textbook for implementing the educational policy of "textbook-based mastery learning" faithfully. Especially, this study developed and presented one prototype of English digital textbook for middle school students as one practical example. This study utilized some research methods of literature review, case analysis, expert panel meeting, and seminar.

Through the literature review, this study investigated main principles of designing and developing prototypes of digital textbooks and usability of digital textbooks. In addition, this study analyzed some previous studies of English digital textbooks.

This study also analyzed some cases of the developed digital textbooks in domestic and foreign countries. These cases included digital textbooks for experimental schools, some digital textbooks of English which were developed by educational publishing companies in domestic and foreign countries, and prototypes of some digital textbooks of Social Studies, Science, and English which would be applied in schools after 2014.

In addition, this study drew principles of designing and developing digital textbooks from literature review and expert panel meetings. It utilized design principle of "universal design for learning (UDL)" for considering students' cognition, and accessibility and usability of digital textbooks carefully.

It also explored some components of designing and developing digital textbooks in context of educational content construct, design of teaching and learning, and design of educational evaluation. First, in context of educational content construct, it employed "content-based instruction (CBI)" and "whole language approach (WLA)" which were important teaching and learning approaches in English education for reflecting characteristics of English digital textbooks effectively. Second, in context of design of teaching and learning, this study employed some educational approaches of differentiated instruction, support of self-directed learning, and activation of student interaction. Third, in context of design of educational evaluation, this utilized "curriculum-embedded formative assessment" and "embedded assessment" by connecting students' learning activities with achievement standards based on the National Curriculum. Then, it drew principles of linking educational contents, teaching and learning, and educational evaluation with one another through digital textbooks effectively.

60 http://www.kice.re.kr/boardCnts/view.do?boardID=1500253&boardSeq=2141832&lev=0&m=0301&searchType=null&statusYN=W&page=1&s=english

This study developed one prototype of English digital textbook for exploring ideal direction of designing and developing digital textbook. It developed prototypes by utilizing learning contents of one section, “The Beauty of Korean Culture” in English print textbook for middle school students of educational publishing company A. It applied principles and components of digital textbook which were drawn through diverse research methods used in this study. Specifically, it included some functions and evaluation activities for supporting effective differentiated instruction mainly in listening and reading domains. Also, it is composed of some functions and activities for increasing student interaction and facilitating collaborative learning mainly in speaking and writing domains. In addition, it included design and module for supporting task-based learning effectively in the last part of the section. This study developed diverse evaluation activities such as diagnostic, formative, and summative evaluation and online report form of students’ learning outcomes for students and teachers. Additionally, the prototype was composed of some functions of helping linking internal contents with external contents and facilitating learning motivation by offering multimedia resources, online dictionary, wordbook, and so on. The ultimate aim of this study was to explore effective strategies of developing ideal digital textbook in order that the digital textbook policy of the government can be implemented faithfully.”

REFERENCES

Adamowski, J. (2014, February 4). Can textbook nationalization curb "profiteering publishers"? *Publishing Perspectives*. Retrieved from http://publishingperspectives.com/2014/02/can-textbook-nationalization-curb-profiteering-publishers/#.V5METjc5G-4

Adamowski, J. (2015, June 2). In Poland, the market for digital textbooks expands. *Publishing Perspectives*. Retrieved from http://publishingperspectives.com/2015/06/in-poland-the-market-for-digital-textbooks-expands/#.V5NLgjc5G-4

Auditor General, Morocco. (2014). *Évaluation de la stratégie Maroc Numeric 2013.* Retrieved from http://www.fondationmarocnumerique.org/download/Evaluation-MN13.pdf

Barna, I., & Zentai, P. L. (n.d.) The end of educational book market in Hungary. Retrieved from http://fep-fee.eu/The-end-of-educational-book-market

Citi Project (n.d.). Retrieved from http://citi.aui.ma/index.php?option=com_content&task=view&id=278&Itemid=164

Farhan. (2014, February 13). Challenges in implementing digital textbooks in Malaysia. *Lowyat.net*. Retrieved from https://www.lowyat.net/2014/19015/challenges-in-implementing-digital-textbooks-in-malaysia/

Farrington, J. (2013, December 20). Hungary nationalizes textbook market. *The Bookseller*. Retrieved from http://www.thebookseller.com/news/hungary-nationalises-textbook-market

Fredriksen, B., & Brar, S. (with Trucano, M.). (2015). *Getting textbooks to every child in sub-Saharan Africa: Strategies for addressing the high cost and low availability problem*. Washington, DC: World Bank. Retrieved from https://openknowledge.worldbank.org/handle/10986/21876

Glewwe, P., & Muralidharan, K. (2015). *Improving school education outcomes in developing countries: Evidence, knowledge gaps, and policy implications*. Retrieved from http://www.riseprogramme.org/sites/www.rise.ox.ac.uk/files/RISE_WP-001_Glewwe_Muralidharan.pdf

Hagemann, M., & Hugyecz, P. (2016, March 10). Poland is pioneering the world's first national open textbook program. *Open Society Foundations.* Retrieved from https://www.opensocietyfoundations.org/voices/poland-pioneering-worlds-first-national-open-textbook-program

Hattie, J., & Yates, G. (2014). *Visible learning and the science of how we learn*. New York: Routledge.

Jabłońska-Stefanowicz, E. (2014). Polish textbook market (1970–2012): Changes and tendencies, *Knygotyra*, *63*, 62–76. Retrieved from http://www.zurnalai.vu.lt/files/journals/51/articles/4009/public/62-76.pdf

Jang, D., Yi, P., & Shin, I. (2016). Examining the effectiveness of digital textbook use on students' learning outcomes in South Korea: A meta-analysis. *The Asia-Pacific Education Researcher, 25*(1), 57–68.

Joo, H., Ka, E., Ahn, C., Nam, C., Park, D., & Yun, J. (2013). A study on the development of digital textbooks: Designing a prototype of digital English textbooks. Retrieved from http://www.kice.re.kr/boardCnts/view.do?boardID=1500253&boardSeq=2141832&lev=0&m=0301&searchType=null&statusYN=W&page=1&s=english

Keim, B. (2012, January 26). iPad textbooks: Reality less revolutionary than hardware. *Wired*. Retrieevd from http://www.wired.com/2012/01/ipad-textbooks-learning/

Kim, J. H. (2014). Apple's iBooks author: Potential, pedagogical meanings and implementation challenges. In Z. Yang, H. H. Yang, D. Wu, & S. Liu (Eds.). *Transforming K-12 Classrooms with Digital Technology* (pp. 119-139). Wuham: Central China Normal University.

Kim, J. (2016, July 18). South Korean students to get digital textbooks by 2018. *Koogle TV*. Retrieved from http://www.koogle.tv/media/news/south-korean-students-to-get-digital-textbooks-by-2018/

Kim, K., & Jo, S. (2014, June 14). Korean schools are getting SMART. *Korea JoongAng Daily*. Retrieved from http://koreajoongangdaily.joins.com/news/article/article.aspx?aid=2990585

Lamtara, S. (2014). Teachers' ICT practices: A case study of a Moroccan EFL teacher. *Arab World English Journal*, *5*(4), 398–410. Retrieved from http://www.awej.org/images/AllIssues/Volume5/Volume5number4Decmber/26.pdf

Lin, Y.-C., Liu, T.-C., & Kinshuk. (2015). Research on teachers' needs when using e-textbooks in teaching. *Smart Learning Environments, 2*(1). Retrieved from https://slejournal.springeropen.com/articles/10.1186/s40561-014-0008-1

Marzouk, H. (2015, April 15). Tunisie – Engseignement: Des tablettes remplaceront les cartables [Tunisia – Learning: Tablets will replace school satchels]. *L'Économiste maghrébin*. Retrieved from http://www.leconomistemaghrebin.com/2015/04/15/tunisie-enseignement-des-tablettes-remplaceront-les-cartables/

Maughan, S. (2015, August 28). School and library spotlight: How schools buy and use e-books. *Publishers Weekly*. Retrieved from http://www.publishersweekly.com/pw/by-topic/industry-news/libraries/article/67927-school-and-library-spotlight-how-schools-buy-and-use-e-books.html

Murai, S. (2015, June 1). E-textbooks to open digital can of worms. *The Japan Times*. Retrieved from http://www.japantimes.co.jp/news/2015/06/01/reference/e-textbooks-open-digital-can-worms/#.V6XpFjfRP2c

Nazih, A. (2016, May 4). TIC à l'école: Gros efforts, avec les moyens du bord. *L'Économiste*. Retrieved from http://www.leconomiste.com/article/996090-tic-l-ecole

OECD. (2008). *Study on digital learning resources as systemic innovation: Country case study report on Finland*. Retrieved from http://www.educationscotland.gov.uk/Images/OECD%20-%20Digital%20learning%20Finland_tcm4-541597.pdf

OECD. (2015). *Students, computers and learning: Making the connection*. Paris: OECD Publishing. Retrieved from http://www.oecd-ilibrary.org/docserver/download/9815021e.pdf?expires=1469206689&id=id&accname=guest&checksum=95F36D5B4E8BCAA46BDCA80AF9ED3721

Rajaendram, R. (2016, July 3). Moving forward with e-Books. *The Star*. Retrieved from http://www.thestar.com.my/news/education/2016/07/03/moving-forward-with-ebooks/

Read, T. (2015). *Where have all the textbooks gone? Toward sustainable provision of teaching and learning materials in sub-Saharan Africa*. Washington, DC: World Bank. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/22123/9781464805721.pdf?sequence=1&isAllowed=y

Royaume du Maroc: Conseil Supérieur de l'Éducation, de la Formation et de la Recherche Scientifique. (2015). *Vision Stratégique de la Réforme 2015-2030: Pour une école de l'egalité de la qualité et de la promotion*. Rabat: Conseil Supérieur de l'Éducation, de la Formation et de la Recherche Scientifique.

RTI International. (2015.) *ICT in Education – Talking Points Prepared for Nepal EGRP*.

RTI International. (2013). *Turkey's FATIH Project: A plan to conquer the digital divide or a technological leap of faith?* Retrieved from http://www.rti.org/sites/default/files/resources/fatih_report_eri-rti_dec13.pdf

Śliwowski, K., & Grodecka, K. (2013). *Open educational resources in Poland: Challenges and opportunities*. Retrieved from http://iite.unesco.org/pics/publications/en/files/3214727.pdf

The Open University of Hong Kong. (n.d.). *Open textbooks for Hong Kong.* Retrieved from http://www.opentextbooks.org.hk

The Open University of Hong Kong. (2014). *OUHK embarks on open textbook project.* Retrieved from http://www.opentextbooks.org.hk/news/21

The Open University of Hong Kong. (2016). *First free open textbooks for Hong Kong aims to reduce textbook prices and promote e-learning.* Retrieved from http://www.ouhk.edu.hk/wcsprd/Satellite?pagename=OUHK/tcPortalPage2014&CCNAME=CCNEWS&c=C_PAU&cid=1385180081243&dis=11&YEAR=2016&PAGE=1&STU_ANNOUNCE=false&lang=eng

The Results for Development Institute. (2016). *Global Book Fund Feasibility Study: Final report*. Retrieved from http://www.r4d.org/sites/resultsfordevelopment.org/files/resources/R4D-IEP_GBF_Full%20Report_web.pdf

TNS Sofres. (2014). *Les usages des manuels numériques en 2014: Principales évolutions depuis 2011*. Retrieved from http://www.tns-sofres.com/sites/default/files/2014.10.03-manuels-numeriques.pdf

Yeung, M. (2015, December 15). A matter of publish or perish. *China Daily Asia*. Retrieved from http://www.chinadailyasia.com/focus/2015-12/15/content_15358688.html