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Cultural Organization

ICT in Education Teachers' Professional Development Toolkit

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Contents

Acronyms

CCNC	Commonwealth Computer Navigator's Certificate
CCTI	Commonwealth Certificate for Teacher ICT Integration
CFT	Competency Framework for Teachers
COL	Commonwealth of Learning
ComSec	Commonwealth Secretariat
ICT	information and communication technology
M&E	monitoring and evaluation
OER	open educational resources
UNESCO	United Nations Educational, Scientific and Cultural Organization

ICT in Education - Teachers' Professional Development Toolkit

Welcome

This toolkit contains a set of resources used to introduce Information and Communication Technology (ICT) into Teacher Education. The utility of these resources span from creating an ICT in Education strategy, collecting education data, considering approaches to advocacy, designing curriculum to materials development and provides a set of open materials that could be used for training new or in service teachers.

The tools contained here were developed through a partnership of UNESCO, the Commonwealth Secretariat, the Commonwealth of Learning (COL), Microsoft and the Ministries of Education of a number of countries in the Caribbean and Pacific committed to enhancing Teacher Education.

The approach suggested by these tools and supported by the accompanying justification contained here calls for an adoption, and where necessary the adaption, of Open Education Resources (OER) selected and aligned to the UNESCO ICT Competency Framework for Teachers (CFT). The UNESCO ICT CFT provides structure for a comprehensive ICT in Education programme or course. The video below, produced by COL, introduces this critical element in the approach.

THE UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS			
	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

Increasing teachers' ICT competency through open educational resources

UNESCO supported the Indonesian Ministry of Education and Culture to hold a workshop on Harnessing the Use of Open Educational Resources (OER) for the ICT Competency Framework for Teachers (ICT CFT) in Jakarta, Indonesia on 27 June 2013. The workshop focused on the potential of OER for supporting the rollout of the ICT Competency Framework for Teachers and its potential to contribute to Indonesia's educational goals for building knowledge societies.

The Executive Chairman of the Indonesian National Commission for UNESCO, Prof. Dr. H. Arief Rachman, highlighted in his opening remarks the importance of the development of OER-based teacher training tools for ICT integration, which makes the project activities relevant to real world problems. Prof. Dr. Rachman also underscored the need to ensure that Indonesia's 2.7 million teachers are properly trained to integrate ICT effectively in their teaching. This UNESCO-supported workshop contributed to the Indonesian Government's objectives to promote the use of ICT for the construction of knowledge societies, ensuring that teachers have the necessary ICT skills for quality teaching and learning.

The important work that Indonesia has undertaken in developing a policy on OER and teacher training standards for ICT CFT (in cooperation with Intel) was underscored by participants as an important basis for the development of project activities.

The discussions focused on the priority area of technical vocational education at secondary level. In this regard, it was agreed to focus the project activities on teacher education materials in this area.

The workshop gathered participants from the Ministry of Education, non-governmental organizations and the World Bank. Private sector partners involved in the development of ICT CFT, namely CISCO, INTEL and Microsoft, were also invited to participate in the event.

This activity is part of UNESCO's continued efforts to promote the application of ICT to enhance the quality of and access to education, including the stimulation of production, sharing and access to open educational resources (OER). After the adoption by UNESCO of the Paris OER Declaration in 2012, the implementation of this activity in Indonesia, Kenya and Oman is supported by the Hewlett Foundation.

Defining the Value Proposition

The increasing global move toward knowledge societies, wherein knowledge is the primary production resource rather than capital and labour, has placed increasing emphasis on the need to ensure that individuals are educated and become skilled participants in society and the economy. Information and communication technology (ICT) is regarded as an essential means to support the achievement of genuine knowledge societies, often compelling education systems worldwide to adopt strategies to encourage its integration into education systems.

The possible benefits of introducing ICT at the school level are widely documented, and its value and significance are particularly noted with regard to its potential to improve teaching and learning strategies, enhance communications and productivity, and improve management and administration. For example, teachers indicate that the use of productivity software provides powerful tools to demonstrate learning. Furthermore, access to the Internet has provided a cost-effective way to supply staff and students with the latest quality resources where previously under-resourced media centres and libraries struggled to meet this demand. Additionally, teachers and school management use software solutions to streamline and automate class and school administration tasks. In some instances, school data is collected within a school information system that integrates all aspects of school life, from admissions, marks, and student and staff information to report creation, library records, finance and even the generation of student promotion schedules required by district, provincial and national education offices. As more schools adopt digital systems, the collection, sharing and analysis of school data with district officials and central education ministries also promises improved educational planning at a national level.

Harnessing ICT effectively to build knowledge societies and more effective education systems has implications for changing skills requirements, particularly for teachers. As teachers are at the heart of curriculum delivery, they play a pivotal role in the adoption and integration of ICT in education. However, despite the potential contribution of ICT in education, many countries have a shortage of ICT professionals and lack teachers with ICT skills. The relatively recent appearance of user-friendly educational technologies means that older generations of trained teachers are either ignorant of the potential of ICT and/or lack the skills and confidence to deploy it effectively. In addition, ICT in Education curricula for both pre- and in-service teachers are often either non-existent or have been tacked onto existing subject curricula and treated unevenly, almost as an afterthought, rather than being properly integrated into learning programmes.

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There are as many schools of thought on how best to equip teachers with skills and knowledge to use ICT for teaching as there are tried-and-tested models for professional development. The dominant schools of thought regarding ICT integration are divided on the issue of whether teachers need ICT literacy skills regardless of how those skills will be applied pedagogically, or whether ICT integration should be deployed in a manner that equips teachers with ICT literacy skills and at the same time shows teachers how to use these skills to plan lessons and utilise technology for teaching and learning. Increasingly, approaches toward the latter are becoming more widespread, moving towards ICT skills being deployed in a context of broader educational reform, which embraces a shift away from teacher-centred, lecture-based instruction toward student-centred, interactive, constructivist learning. As one example, the UNESCO ICT Competency Framework for Teachers emphasises that it is not sufficient for

teachers to have ICT skills and be able to teach these to their students; they need to help students become collaborative, problem-solving, creative learners by using ICT so they will be effective citizens and members of the workforce.

It is clear that teacher professional development is essential to create new learning environments. Thus, ongoing investment in continuous teacher training and professional development offerings is vital for successful use of ICT in education. As a contribution to this process, this toolkit introduces a series of tools which address teacher professional development, based primarily on project experiences of the Commonwealth of Learning (COL), Commonwealth Secretariat (ComSec) and Microsoft in Caribbean and Pacific countries. It outlines what the tools are, provides links to them for downloading purposes, describes activities that can be implemented to use the tools effectively and presents a few hypothetical scenarios to illustrate their potential application. These tools can be harnessed as part of national or institutional strategies ensuring that ICT in education is effectively integrated into the training of new teachers and the continuing professional development of in-service teachers.

1 Where the Tools Come From (Context of Tool Development)

The tools and activities described here reflect the experiences of COL, ComSec, Microsoft and their Caribbean and Pacific government partners in the revision and improvement of teacher education through devising professional development initiatives for ICT in education. In Guyana, this entailed: surveying current ICT trends at schools, higher education (HE) institutions and the ministry of education; evaluating current government-sponsored ICT in education projects; creating professional development, advocacy and communication, and monitoring and evaluation strategies; reviewing ICT in education curricula at both HE institutions in Guyana; creating an "ICT in Education for Teachers" course of over 150 notional hours; and training staff to deploy the course.

St. Vincent and the Grenadines also needed an ICT in education professional development strategy for teachers. The main concern, however, was to devise ways to improve human capacity to support the activities stated therein. COL and ComSec helped devise plans to develop one cache of ICT in education "master teachers" who would act as mentors to others, and another cache to provide ICT in education training for school principals. A COL/ComSec facilitator also created an instrument to select teachers most likely to succeed at ICT in education training.

Both Trinidad and Tobago and Dominica were supported through the development of an ICT in education professional development strategy for teachers. Dominica also needed a set of baseline survey tools to identify current ICT in education trends. Samoa already had clear ICT in education policy directives but did not have a clear implementation plan. COL and ComSec provided advice on these issues and also offered access to a number of open-license ICT in education programmes for teacher education institutions to adapt and deploy.

The participating countries can be characterised as having modest access to skills capacity and financial resources. Consequently, the activities and tools described here are designed to work in environments where skills and funding to revise and adapt the teacher education curriculum and to develop associated teaching resources are in short supply

(although they would be equally useful in better resourced environments). Simultaneously, though, these countries are in no way identical, and each has approached the problem of revising teacher professional development programmes differently. Consequently, COL and ComSec have supported each nation in unique ways and have developed and deployed customised strategies to achieve the desired end.

Through discussion and collaboration with teachers, teacher trainers and education ministry personnel in these countries, COL and ComSec were able to assemble various tools that comprise the "toolkit" described here. In addition, a resource produced before these activities — the UNESCO ICT Competency Framework for Teachers (ICT-CFT) — provided a conceptual framework for activities in every country. This framework is intended to inform education stakeholders about the role that ICT can play in enhancing different aspects of education. The set of teacher competencies described in the framework are designed to facilitate improvements to school administration, teaching and learning, and teacher professional development, through the exploitation of technology.[1]

2   An Overview of Available Tools

The work described above involved advising and supporting ministries of education and teacher training institutions to strategise and implement key activities. This necessitated the development of tools designed to support these activities. Generic versions of the tools and some sample documents now comprise a powerful toolkit that can be harnessed to implement ICT in education professional development strategies for teachers. These tools are licensed under a Creative Commons Attribution license,[2] and we encourage others who see value in them for supporting ICT in education activities in their country or institution to adapt and use them as they consider appropriate.

2.1   ICT Competency Framework for Teachers

A critical question is what *are* the ICT skills, values and proficiencies you want your educator community to strive towards? A good way to start answering this question is by interrogating the UNESCO ICT Competency Framework for Teachers. This framework provides a comprehensive set of essential competencies defined and agreed by an international committee of educators working under the banner of UNESCO.

Its unique cyclical structure encourages teachers to develop their skills in ever more sophisticated ways. Early work focuses on digital literacy, a second band encourages a deepening of understanding and the third band calls for the application of knowledge through the creation of new teaching tools and products. These levels of sophistication approximate the developmental needs of students at both teacher training colleges and universities (education faculties). The framework calls for study, within each band, of the following education

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[1] Read more about the UNESCO ICT-CFT on the UNESCO website: www.unesco.org/new/en/unesco/themes/icts/teacher-education/unesco-ict-competency-framework-for-teachers

[2] Creative Commons copyright licenses offer a middle ground between full copyright, which reserves all rights, and public domain, which reserves none. Individuals and institutions can choose a combination of rights that make it easier for others to copy, distribute, edit, and mix the resource while at the same time preserving attribution rights, amongst others, for the creator. For a full description of the available licenses, visit Creative Commons at http://creativecommons.org/licenses

topics: the national education sector; curriculum; pedagogy; assessment and administration; ICT skills; and teacher growth. Consequently, the framework focuses primarily on education needs rather than technology per se and therefore sees technology in a supporting role.

UNESCO has produced a document that outlines the underlying philosophy, the defined competencies and the framework which holds them together. A positive consequence of closely aligning ICT in education teacher professional development strategies to the UNESCO framework is that one can more easily identify open teaching courses and materials to support the training (there is an expanding pool of teacher training resources that cover UNESCO competencies), while also ensuring adherence to a globally recognised set of competencies and standards.

UNESCO [ICT Competency Framework for Teachers](.).

2.2   ICT in Education Surveys

These survey tools were designed to ascertain where education stakeholders stand in terms of their ability to implement ICT in education initiatives. Designed to support baseline capacity audits, the three versions offered below survey ICT usage by personnel at schools, teacher training institutions and ministries. The surveys ascertain what ICT is currently being used for and individual proficiency levels, and also what the stakeholders believe ICT can contribute to education, thus providing an indicator of willingness to advance. They are designed to be simple and quick to administer, relatively straightforward to analyse, and repeatable to enable comparative surveys to be completed longitudinally.

ICT in Education: [Teacher Survey](.)
ICT in Education: [Teacher Educator Survey](.)
ICT in Education: [Ministry Survey](.)

2.3   ICT in Education Professional Development Strategy Document

The blueprint! A document whose purpose is to combine different ICT in education initiatives at school, college and ministerial levels, provide direction and identify priorities and key initiatives can hardly be written using a template. Each context will be different, requiring sensitive insight and creative responses to potential problems and barriers. However, much can be learned by perusing such documents written for particular settings. While slavish adherence to what is written in any of the documents below will result in a cumbersome solution, they are useful in showing the types of issues that need to be considered when devising a suitable strategy:

Guyana: [ICT Professional Development Strategy for Teachers](.) (2010)
St. Vincent and the Grenadines: [ICT Professional Development Implementation Plan for Educators](.) (2012)
Dominica: [ICT Professional Development Implementation Plan for Educators](.) (2012)
Trinidad and Tobago: [ICT Professional Development Implementation Plan for Educators](.) (2012)

2.4   Curriculum Map Template

While it can be argued that all the UNESCO competencies are important, it is not always possible to free up enough time to cover them all in either pre-service training or in-service professional development courses. Consequently, it is important to choose and then map a proposed ICT in

education curriculum in as much detail as possible before developing courses and teaching and learning materials to support professional development initiatives. The completed template tool below uses a spreadsheet to map a curriculum for an ICT in education course developed originally for Guyana. It uses extensively the structure and competencies identified in the UNESCO ICT-CFT. It also identifies potential open educational resources (OER) that could be used by course developers to build the course.

The spreadsheet functionality allows course planners to "balance" desired competencies accurately with the available contact/notional hours, in this instance sixty notional hours for Technology Literacy and ninety hours for Knowledge Deepening. Strip out the Guyana detail for a clean template to start your own mapping.

Curriculum Map Template (Guyana ICT in Education for Teachers course)

2.5   Teacher Basic ICT Readiness Assessment Tool

In one particular context, a method was needed to determine whether nominated school teachers were likely to encounter success in the various ICT in education professional development training initiatives described below. This was necessary because most courses aimed at encouraging the use of ICT in teaching require proficiency levels above those of a first-time user. This test is disarmingly simple, yet effective and easy to implement. The test also comes with setup instructions, an assessment protocol, and a marking memo. It is designed to be administered by school personnel and can easily be adapted.

Teacher Basic ICT Readiness Test

2.6   ICT in Education for Teachers Course and Materials

Through the implementation of country-specific activities, we discovered the value in using a course development model that is more closely aligned with web development approaches than with traditional publishing models. This allows for a shorter time to initial deployment, entails regular iterations of design and testing, and encourages more frequent versioning of courses. It is also much cheaper than traditional courseware development. (See Appendix A for a more detailed description.)

Using this approach after one has mapped the curriculum focus turns to developing ICT in education course materials and training guides using free and open resources. The advantage here is that by building wraparound guides to existing materials and keeping repurposing to a minimum, these courses can be developed cost-effectively and over a relatively short period. An entire programme can be "assembled" at very little cost.

As a consequence of the work in Guyana, however, there is now a set of assembled courses already comprised of OER, which can be further refined and adapted in new contexts (as has recently been done by the Sampoerna School of Education in Indonesia, for example). Adapting an existing course makes it even quicker for derivative programmes to be deployed. Developed by adapting OER and aligned closely with the UNESCO ICT-CFT, this set of ICT in education units provides the substance for context-relevant teacher professional development. The course also

includes facilitation notes for facilitators new to the field of ICT in education. The course has been made available under a Creative Commons Attribution license, which allows repurposing, and can be used as a starting point for the development of new courses in different countries. It exists in both paper and electronic formats, and has been designed to work in low-tech environments where connectivity is not robust.

Use the hyperlink below to access the full ICT in Education for Teachers course and think about what you need to change (scope, content, activities and/or assessment) to make it contextually relevant.

ICT in Education for Teachers course (Pre-Service Edition)
ICT in Education for Teachers course (In-Service Edition)

Another option for customising existing ICT in education professional development programmes includes COL's own Commonwealth Certificate for Teacher ICT Integration (CCTI) course, which does an excellent job of exposing teachers to good practice when deploying technology in their classrooms and schools. A course aimed at providing beginner teachers with basic ICT skills is the Commonwealth Computer Navigator's Certificate (CCNC) course. Both of these certificate courses can be customised and run by local service providers.

Information about the CCTI course
Information about the CCNC course

2.7   An ICT in Education Advocacy Strategy

Once the ICT in education strategy is being deployed and professional development opportunities are available, how do we get teachers on board, spread awareness, incentivise and open up channels of communication? The writing of a communication and advocacy strategy document can help senior management consider what options would work within their context. A template would not do this planning any justice. Instead, the toolkit contains an example from Guyana that can be used as an initial starting point for discussion and debate. Extract from it any pertinent ideas and approaches, but it is imperative that new documents both heed local norms and expectations and identify communication channels that reach all stakeholders.

Guyana Communication and Advocacy Strategy (2011)

2.8   Monitoring and Evaluation Strategy

How do we know whether the strategies and related activities are having the desired impact? A monitoring and evaluation (M&E) strategy is essential to ensure the desired objectives are being achieved. The M&E document below is an example of one such strategy. Interrogate and reconstruct it to suit local needs and conditions.

Guyana M&E Strategy (2011)

3   Using the Tools

In an ideal situation, the activities listed below might act as stepping stones to achieve an environment where both pre- and in-service teachers can integrate ICT into their daily responsibilities seamlessly and confidently. Rather than studying these activities in sequence, one

should rather regard them as items on a menu. Consider what combination and order would be appropriate for your context. The tools presented above were developed to support many of these key activities.

- **Conduct an eReadiness Audit:** Where are teachers, teacher trainers and education officials in terms of their ICT proficiencies? How might one describe the typical ICT setup in schools, colleges and the ministry? It is necessary to identify infrastructure, equipment and skill baseline levels in order for planned strategies and activities to respond appropriately to the existing context. Audit schools, teacher training colleges, faculties of education, district offices and the ministry to ascertain this information.

> Toolkit Tip: When developing instruments to collect this data, use the surveys identified in the toolkit and adapt as necessary. Ensure a big enough sample of each stakeholder group is canvassed and then collate results to see where skills and attitudes are positioned. The aggregate information can help to inform the ICT in education strategy document.

- **Review National ICT and Education Priorities:** Determine to what extent the existing national policy environment either supports the training of teachers to integrate ICT into their duties or needs to be changed so that it does support this. In some instances, a national ICT policy will have been developed, while in others, ICT has been incorporated into other sector policies. Evaluate what role ICT is supposed to play within the education sector and determine what strategies have been formulated to actualise the vision.

- **Establish an ICT in Education Steering Committee:** Set up a body of local and international authorities, at the highest possible level, to drive the programme forward. This group will act as a think tank, but also as troubleshooters when problems look likely to derail the programme. Consequently, the committee will need influence. Where possible, it will benefit from international participation and input to enable benchmarking of national strategies and activities against international best practices.

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- **Devise an ICT in Education Implementation Strategy:** From the results of the survey or audit, identify the gaps and develop a strategy to close them. Formulate a set of specific activities that will respond to the findings and recommendations of the policy review and eReadiness audit, and allocate funds to ensure the implementation activities can be carried out.

> The toolkit contains four sample strategy documents from Caribbean countries, focusing on teacher professional development but also considering wider ICT in education issues. These can be reviewed for ideas on relevant approaches and directions.

- **Review and Revise the ICT in Education Curriculum:** Determine to what extent teacher education and professional development programmes need to be revised so that they integrate ICT into operations effectively and encourage the attainment of the perceived education benefits covered in the policy environment. Ideally, the revised curriculum should see the integration of ICT into the training of **all** teachers, not just those who teach subjects focussed on technology. An ideal option would be to formulate a compulsory ICT in education course that

focuses on the role of ICT in education policy, curriculum, pedagogy, assessment, administration and professional development, as well as subject method.

The toolkit includes a copy of the UNESCO ICT-CFT, which helps reviewers to identify ideal competencies, and a curriculum planning template for those tasked with revising the curriculum.

- **Identify and Adapt Open Resources and Open Courseware:** In order to develop new teaching and learning materials to support the new curriculum cost-effectively, use existing free open resources and teaching materials and adapt these to contextualise them for local use. In some instances, materials have already been aligned to international ICT in education curricula, such as the UNESCO ICT-CFT. An open license allows repurposing of those resources that need to be adapted.

Appendix A describes a possible courseware and materials development model in full. The toolkit also contains many items that can support this activity. There are links to four existing ICT in education courses, two of which have used free and open resources and can be easily adapted. Also provided in the Guyana curriculum planning template is a list of available OER that have the potential to provide content to support the achievement of the UNESCO ICT-CFT competencies.

- **Develop an Advocacy Strategy:** Determine how to spread awareness of the various initiatives identified in the implementation strategy, establish communication channels between the schools, higher education institutions, district offices and ministry, and devise a reward system or incentivise educators who "buy in" to the programme vision.

The toolkit contains a sample document from Guyana which identifies the strategies the ministry advocated there. Interrogate and extract approaches as appropriate, but ensure your document responds to local conditions.

- **Train Pre- and In-Service Teachers to Integrate ICT into their Operations:** Set up structures so that the training of teachers can be rolled out. This would include instructor training and other initiatives at both college and faculty levels, as well as professional development courses for those teachers already working.

In the toolkit are links to full ICT in education courses that also contain facilitation notes to help with training those personnel who will be tasked with conducting this training.

- **Monitoring and Evaluation, and Revision of the Strategy, Courses and Materials:** Running concurrently with many of the items above, M&E should collect experiences and feed recommendations into a continuing process of revision and improvement. It is a good idea to consider your M&E strategy prior to any development, in order to evaluate the effectiveness of planning and development phases, as well as professional development deployment.

The Guyana M&E strategy is included in the toolkit as a starting point for devising local variations.

Readers of the above list will in all likelihood comment that in their context, some — or perhaps many — of the activities described above have already been commenced or completed, so the purpose here is to identify a set of free and open tools that can be adapted to support those key activities still to be concluded.

4 Scenarios

Below are three scenarios in which different needs necessitate the use of different combinations of the key activities and tools.

4.1 Scenario 1: Need for Education Authority Frameworks

This first scenario might arise when the ICT in education professional development initiative is being driven by individuals from within the education ministry or the state or provincial education authorities. This type of personnel would prioritise the identification of tools that would allow the authority to coordinate activities and initiatives. They would place value on tools that provide frameworks for others to conduct their specific ICT in education responsibilities.

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In Guyana, for example, many of the key activities described above were already in place. There was evidence that tertiary education students were bringing their own laptops to class. Both the University of Guyana's Faculty of Education and the Cyril Potter College of Education had different ICT in education curricula that were being implemented. The government was piloting a number of ICT "success maker" laboratory installations at various primary and secondary schools.

What was required was a "blueprint" to align and mesh these ICT in education initiatives. Existing initiatives were often working in isolation and on occasion counter-productively. Arising from this need was the Guyana ICT in Education Professional Development Strategy. This document acted as a much-needed implementation plan. The strategy, developed by the government with support from COL and ComSec, focussed principally on the professional development of teachers at both the pre- and in-service levels but also acted as a framework identifying key activities. For example, it proposed a review of existing ICT in education curricula in order to establish a new set of courses to coordinate activities across both HE institutions. It also established a need to develop new teaching and learning materials to suit the different complexities required by different levels of study. Finally, the strategy identified a need for training key personnel, monitoring and evaluation, and ongoing communication and advocacy. Within this strategy, the UNESCO ICT-CFT provided a structure for rethinking the ICT in education curriculum. The key competencies as defined in the UNESCO framework provided Guyana education officials with an international framework to use as a starting point when developing local variations of ICT in education curricula that had emerged independently at both college and university levels.

Similarly, the advocacy and communication and M&E strategy documents developed in Guyana were responses to the ministry's need to encourage adoption, reward participation, and coordinate communication by all stakeholders, and later evaluate the success of the programme. These strategy documents again provided a framework for ensuring the coordination of all ICT in education endeavours and their evaluation.

4.2   Scenario 2: Need for Institution-Driven Change

This second scenario might arise when institutional leads want to revise teacher education, possibly either within the framework of a national strategy or on their own initiative. This toolkit would provide assistance to these individuals who wish to include ICT "know-how" and understanding in the training of both pre- and in-service teachers.

The UNESCO ICT-CFT, championed above as a framework for ministry officials responsible for curriculum revision, can also work as a framework for college and faculty staff desiring to develop specific competencies in their pre- and in-service teachers. The competencies described within the framework are an excellent resource from which to choose what needs to be emphasised within any professional development programme. It is important that all subject teachers appreciate the beneficial role that ICT can play in the teaching of their subject.

The curriculum mapping template is a tool principally for course designers, and is thus useful for any staff tasked with either developing a new course or revising an existing one. Balancing credits, time and significant outcomes or objectives is always a tricky task, and this template allows an overview of what is deemed important and how those competencies/knowledge might be achieved.

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In St. Vincent and the Grenadines, as well as in Samoa, the lack of human capacity to first develop a fully operational ICT in education course and then find instructors for both the pre- and in-service teacher training was seen as the largest hurdle. The toolkit, containing a fully fleshed-out course, copyrighted with an open license permitting repurposing, is a boon to those institutions facing similar concerns. They simply need to adapt the ICT in Education for Teachers course, either the pre- or the in-service version, rather than developing one from scratch. This course also contains facilitation notes for instructors to ease their training of new personnel for the task.

4.3   Scenario 3: Need to Ascertain Success

Whether teacher training is organised by the ministry or by an institution, the role of the researcher is paramount to understanding both the context in which one is working and the extent to which certain activities can be considered effective. The toolkit has something for this group too. The baseline surveys were developed for the Guyana Ministry of Education, who wanted to describe the current context prior to the development of their ICT Professional Development Strategy for Teachers. The surveys were used to collect data from schools, HE institutions and the ministry. However, they can be used and adapted to new circumstances, based on the needs of the entity coordinating the research.

The Basic ICT Readiness Test was developed for St. Vincent and the Grenadines, where the Ministry of Education was in the process of enrolling candidates for the CCTI course and/or the ICT in Education for Teachers course, but was concerned to ensure that the correct candidates were selected from amongst in-service teacher applications. Again, this research/selection tool can easily be adapted for new needs and different courses.

While the M&E strategy is not a research instrument per se, it does provide researchers in the field of ICT in education professional development with an excellent overview of what such a strategy

should take into account and what research agenda should be set. The strategy attached here was initially devised for Guyana but has already been adapted for other national contexts.

5 Conclusion

This document has attempted to show that while developing or revising ICT in education professional development programmes might initially appear daunting at either national or institutional levels, it need not be. Much work in the field has already been completed; consequently, not only is a great deal of guidance and advice available, but frameworks, tools and even full courses are available under open licenses, for adoption and repurposing. This toolkit and the list of key activities described above are the fruits of much discussion and collaborative engagement between COL, ComSec and Microsoft, and their Caribbean and Pacific partners. Hopefully, these tools will enable activity in new contexts.

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Appendix A:
Approach to Curriculum Revision and Materials Development

Introduction

Traditionally, most course designers follow a publishing model wherein they strive for a "polished" final product. The popular and often quoted ADDIE[3] Model is indicative of this approach. "Analyse, Design, Develop, Implement and Evaluate" has been the mantra of a generation of instructional designers. While the model does not exclude the opportunity for reiterative cycles of improvement, the single loop described in the acronym suggests that one round of evaluative reflection should be sufficient for most courses. In many ways, this approach mimics the publishing model that strives to create a polished, authoritative tome, which might be tweaked in subsequent editions but whose first edition can stand alone. Perhaps because many lecturers hope to ultimately publish their research findings and/or their course materials in either journals or academic publications, and their teaching materials as textbooks, the publishing model is easily assumed to be appropriate for course development too.

An alternative approach to the development of courses and their materials, however, might better serve both students and lecturers. The recent creation of a professional development course for teachers in the Caribbean[4] used a very different approach. It brought into play combinations of new course design components and tools that demanded a different mind-set to assemble and deploy the course. The ubiquitous use of electronic materials, along with user-friendly digital technologies and a preference for free and open teaching resources — each of these components characterised

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by constant flux and evolution — demanded a quicker and cheaper development cycle than was normally associated with course design and materials development. The optimal "assemblage" of components one month was quickly superseded by new needs and new opportunities a few months later.

Consequently, the course development model designed for the Caribbean project was closer to what some open source software designers advocate for the development of software: "Release Early, Release Often"[5] (RERO). The thinking is that only once the product is deployed and developers can hear user feedback can it truly be customised to suit user needs, and that more "eyes" make it easier to eliminate bugs or other problems. Regular cycles of testing and revision align the product quickly and cost-effectively with user needs.

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[3] See the Wikipedia entry on the ADDIE model for a more detailed description: http://en.wikipedia.org/wiki/ADDIE_Model
[4] This Teacher Professional Development project was a collaboration between the Guyana Ministry of Education, the Commonwealth of Learning and the Commonwealth Secretariat. See a generic version of the course at http://ccti.colfinder.org/sites/default/files/PreService_International
[5] See the Wikipedia entry on the "Release Early, Release Often" development philosophy: http://en.wikipedia.org/wiki/Release_early,_release_often

With course design, however, there are some other advantages to this approach. Besides responding rapidly to user feedback and fashioning a course aligned with student expectations, this model also enables designers to quickly improve the course as new OER or open courseware become available. The digital nature of the materials allows for quick and cost-effective changes to the content. Course components can be replaced easily without affecting those components that are still desired. Also, as new tools come on the market, be they social networking, productivity or utility tools, these can be accommodated in the existing design with minimal disruption.

In addition, as class sizes grow, students are increasingly expected to be participants in conducting courses in ways that cannot be anticipated during the "development" phase as articulated by traditional models. Class participants can nominate digital tools that they prefer when working with their peers, for reporting and discussing topics and issues.[6] The digital nature of the tools, while not necessarily integrated directly into the course platform, can work in parallel. This model of course development allows for high levels of participant connectivity because it embraces a digital platform for course coordination, but also because it allows for frequent reflection and readjustment based on user feedback and developer evaluation.

The Development Model

The model below contains phases of analysis, development, deployment and evaluation, as all instructional designers would encourage, but the phases do not necessarily follow the sequence previously suggested, while they also often overlap. These processes are mediated through a series of specific activities, a consequence of the new development tools at our disposal. The steps described below outline the activities within a typical development cycle (see Figure 1) and also the pacing of subsequent development phases (see Figure 2):

Figure 1: Activities During a Typical Development Phase (with ADDIE stages approximated)
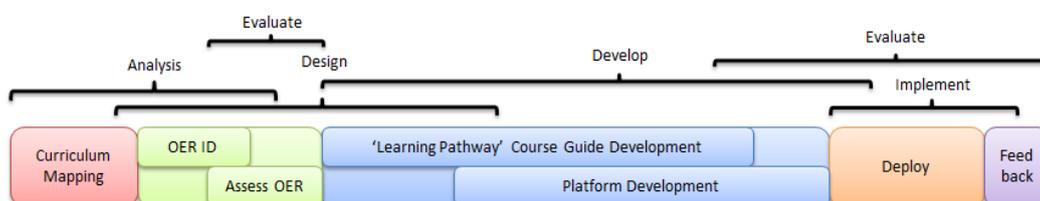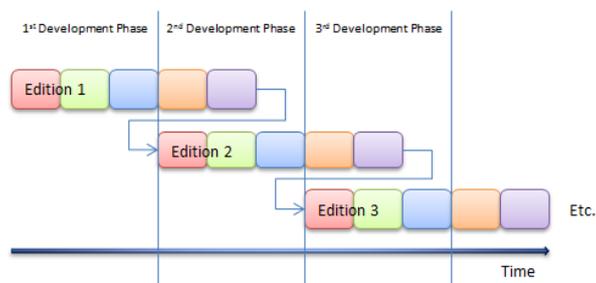

Figure 2: Pacing of Development Phases

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[6] Having multiple channels of communication within a course has become a feature of massive open online courses (MOOCs) and encourages course designers to embrace a decentralised model of class coordination. Read more at Wikipedia: http://en.wikipedia.org/wiki/Massive_open_online_course

1. **Curriculum Mapping:** The proposed course or programme is thoroughly mapped ahead of any development phases. The map contains high-level objectives as well as specific unit outcomes, proposed content, teaching methodology and the number of credits and/or sub-credits. This detail is necessary because the map will shape the development phases and will be used to assess to what extent various draft versions satisfy the course's overall purpose and function.

2. **OER Identification:** An Internet search for OER that support the teaching of the various course units is required. These resources are available free of charge and do not require permission to use, distribute and, in many instances, repurpose. They are copyrighted with an open license — typically a Creative Commons license. Several existing OER websites make this search process easier than it sounds.

3. **Assess Appropriateness of OER:** Beyond pinpointing OER that are closely aligned to the course direction identified by the curriculum map, a developer also must determine the quality and suitability of each OER found, as well as the amount of repurposing required. Ideally, resources should need little or no repurposing. Developers have to assess *how* the OER would be used to achieve the outcomes plotted in the curriculum map. This requires a certain level of creativity and subject familiarisation.

4. **Course Guide Writing:** A course guide is written that identifies a proposed learning pathway through the OER materials via a set of suggested teaching/facilitation plans. In addition to identifying the sequence of learning events, the guide should also offer a suggested set of student activities so that the learning process is not merely didactic but calls on students to engage critically with the sourced OER. Assessment opportunities should also be a component of the guides.

5. **Platform Development:** As the course, materials and guides are digital, a platform should be devised to allow distribution to staff and students. A low-tech solution would be to develop an HTML interface for the materials.[7] This would allow the sharing of course resources via flash disk or CD-ROM should connectivity be an issue. The course materials could be read using mobiles, laptops, eReaders or desktop computers. The digital basis of the course allows for quick revision and updates. In more resourced environments where access to digital media is more prevalent, multimedia can be exploited more readily. Also, communication tools can be harnessed to make the course less "teacher-centred" by encouraging peer-to-peer engagement.

6. **Deployment/Testing:** Much can be learned during the deployment phase. Students and teachers should work through the materials in an authentic setting to thoroughly test the assumptions of the developer(s).

7. **Evaluation:** There should be an opportunity to evaluate the course before it ends. Collect student and staff feedback on how best to improve the course.

8. **Revision:** A revision phase follows so that collected user feedback can inform changes to the course. Issues around curriculum revision, OER selection, the learning pathway with its activities, and assessment need to be reappraised, as does the acquisition of new digital tools.

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[7] To see the interface designed to distribute the course guides, materials and assessment that were handled in the Caribbean project, visit: http://ccti.colfinder.org/sites/default/files/guyana/index.html

Application of the Model in Guyana

COL, ComSec and Microsoft recently supported the development of an ICT Professional Development Strategy for Teachers in Guyana, built around the UNESCO ICT-CFT. Part of the process involved creating a set of training modules for teachers to help them move through basic technological literacy to more advanced use of technology. This was done in recognition that if ICT are to become part of how teachers teach, learners learn and school managers operate, the teacher education curricula (of both pre- and in-service teachers) should reflect the important roles that ICT might play in a typical school. Thus, at a series of meetings with the National Centre for Educational Resource Development (NCERD) and key players from the Guyanese education system, such as staff of Cyril Potter College of Education (CPCE) and the University of Guyana (UG), overall requirements for these modules were defined. These can be summarised as follows:

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1. A pre-assessment tool is required to assess whether participants have basic ICT skills to be able to participate in the first module. If not, students will be provided with a remedial training module to learn basic ICT skills (i.e., use of mouse, keyboard, etc).
2. The Information Literacy module is expected to last approximately sixty to ninety hours, comprising a blend of face-to-face interaction and self study. It draws on the module designs already prepared by NCERD and CPCE, but takes into account the new course descriptions prepared for a revised teacher education programme in Guyana. Development of this module is based on the requirements of the UNESCO ICT-CFT, and to the greatest extent possible draws in existing materials to keep the course design cost-effective and globally relevant.
3. The advanced Knowledge Deepening module, also based on the requirements of the UNESCO ICT-CFT, will last approximately ninety hours and comprise a blend of face-to-face interaction and self study.

Given the limits of available capacity within the relevant Guyanese structure, draft modules were developed by a consultant contracted by COL and ComSec. The innovative curriculum and materials development process used in Guyana involved the following:

1. The existing curriculum was reviewed, which involved examining the ICT in education curriculum at CPCE and UG. It was recognised that the curriculum and associated materials should be designed to work within the national context and mirror the conditions that teachers will find on the ground.
2. A curriculum programme was mapped ahead of any development phases. This was based on the UNESCO ICT-CFT and included high-level objectives as well as specific unit outcomes, proposed content, and teaching methodology. This process allowed writers to weigh the different focus areas and determine the number of hours a student should spend working on the materials.
3. Guided by the curriculum map, a four-person, part-time development team conducted an Internet search for potential resources relevant to the subject matter. In addition to locating OER and free resources that were closely aligned to the course direction identified by the

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curriculum map, the developers also determined the quality and suitability of each resource found, as well as the amount of repurposing required. Resources that required little repurposing were selected as far as possible.

4. The development team constructed a set of simple user guides to lay out the recommended learning pathway through the selected resources. In addition to identifying the sequence of learning events, the team also suggested a set of student activities so that the learning process was not merely didactic but would call on students to engage critically with the sourced OER. In addition, teaching guidelines and a list of further reading and references for the lecturers were assembled.

5. The content was piloted with stakeholders in Guyana to test the development team's assumptions. Various units of the course were deployed at CPCE, where staff reported a mostly positive experience. Initial feedback from CPCE staff, as well as comments and suggestions from UG staff, were all collected and collated to inform revisions to the course materials. During 2012, the Knowledge Deepening course is being integrated into the UG degree programme.

6. A revision phase followed so that the collected user feedback informed changes to the course. This included less emphasis on the teacher facilitation notes, so that they were aimed directly at the students rather than at the lecturing staff and hence became teaching materials rather than guides. In addition, the OER and free resources were downloaded onto a CD-ROM. An electronic version of the course was developed so that staff and students could choose between using the paper-based versions or the electronic CD-ROM. The latter was deemed important to eliminate the need for connectivity.

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The overall cost of the development team is reflected in Table 1.

Table 1   Time and costs of developing OER (the case of the Guyana ICT in education programme)

Development Team	Time (days)	Cost (US$)
Educational consultant/instructional designer/graphic and Web designer/editor	32	16,624
Instructional designer 2	17	6,684
Instructional designer 3	19	7,290
Graphic and Web designer	7	1,453
TOTAL	**76**	**32,051**

According to the educational consultant who was also the main instructional designer, the Information Literacy module lasts approximately seventy hours, whilst the Knowledge Deepening module lasts approximately ninety hours. If one compares the cost of this development with the notional figures provided in the previous section, there is a clear indication that the approach of building a course using existing content is significantly more cost-effective. In Guyana, it took seventy-six days (or 608 hours) to produce 160 hours of learning (of which eighty are effectively text- or print-based and eighty are computer-based instruction). The following table compares Swift's estimates of time to design one notional student hour of learning with the actual time taken to develop the Guyana materials.

Table 2   Comparing the Guyana design with Swift's notional estimates

Media	Swift's notional estimate of time required to produce material equivalent to one notional hour of learning	Actual hours taken to develop one notional learning hour of material
Print	20–100 hours	3.8 hours
Computer-based instruction	200–300 hours	3.8 hours

However, as these estimates are for distance education course development whereas the Guyana courses are a blended learning design, it is possibly more useful to compare the costs with the notional estimates from Bryan Chapman. The result is no less startling.

Table 3   Comparing Guyana design with Chapman's notional estimates

Media	Chapman's notional estimate of time required to produce material equivalent to one notional hour of learning	Actual hours taken to develop one notional learning hour of material
Instructor-led training (ILT), including design, lesson plans, handouts, PowerPoint slides, etc.	34 hours	3.8 hours
Standard eLearning, which includes presentation, audio, some video, test questions, and 20% interactivity	22 hours	3.8 hours

These figures do not indicate an even greater cost saving, as the time reflected also includes the development of content based on international examples (i.e., not Guyana-specific and containing more generic content). Thus, the outcomes of the project were eight versions of content. These are:

• Guyana Pre-service Information Literacy module (print version and CD version)
• Guyana In-service Information Literacy module (print version and CD version)
• Guyana Pre-service Knowledge Deepening Module (print version and CD version)
• Guyana In-Service Knowledge Deepening Module (print version and CD version)
• International Pre-service Information Literacy module (print version and CD version)
• International In-service Information Literacy module (print version and CD version)
• International Pre-service Knowledge Deepening Module (print version and CD version)
• International In-Service Knowledge Deepening Module (print version and CD version)

As all of this content is being shared under an open license, the potential for achieving economies of scale grows further as and where it is used by other institutions. Already, the material is being adapted for use in countries as diverse as St. Vincent and the Grenadines and in Indonesia, where it is being redeployed with marginal redevelopment time required to contextualise the materials effectively.

It is important to note that, in this case, a key contributor to cost reduction was that the leader of the team was multi-skilled and thus able to serve several functions. The education consultant in this instance served multiple roles: as an instructional designer, graphic and Web designer, workshop facilitator and general editor. Traditionally, such functions have tended to be spread across multiple

people, raising costs. This kind of multi-tasking has been facilitated by the growing access to content development tools provided by ICT, but does also suggest that effective economic use of OER for course design and development does require highly-skilled designers to work successfully.

Thus, while curriculum revision and content creation has is often considered a time-consuming and expensive process, the creation of an ICT-friendly component for the teacher education curriculum in Guyana was achieved at a relatively low cost by using an existing curriculum framework (the UNESCO ICT CFT) and repurposing OER.

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