



Harnessing OER to Develop Teachers: The Guyana Experience

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Abstract

The Ministry of Education in Guyana has prioritised increasing the number of qualified teachers by providing opportunities to both pre- and in-service teachers to gain relevant qualifications. This paper describes the process used to redesign the teacher training curriculum in Guyana to achieve the goals of a newly-developed ICT Professional Development Strategy. The UNESCO ICT Competency Framework for Teachers (CFT) was central to the redesign process, and was used to review and reorganize the national teacher education curriculum aimed at pre-service teachers. The framework also influenced plans to provide professional development for in-service teachers, and influenced the selection of Open Education Resources (OER) used to develop a new learning environment and the accompanying learning materials for the teaching of ICT in Education. One of the significant lessons learned during this process is that people rather than technology are crucial to transformation. It is essential to have leadership support at the highest levels but also committed champions at all other levels. The process called for the inclusion of local stakeholders who understood and knew how to respond to contextual constraints. Moreover, the process benefited from the use of existing frameworks and the use of cost effective OER to develop the course materials.

Introduction

Guyana, located on the northern coast of South America, has a predominantly rural population (71% of the population). Functional literacy is of concern, and the government is thus actively tackling the quality of both primary and secondary education in Guyana. A key challenge facing the country's education system is the low retention of qualified teachers and subsequent employment of untrained and unqualified teachers.

The Ministry of Education has therefore prioritised increasing the number of qualified teachers by providing opportunities to both pre- and in-service teachers to gain relevant qualifications. One way of tackling ineffective teaching and low-quality learning in classrooms is by focusing on the use of ICT in teacher education and training. Against this background, the Ministry developed an ICT Operational Plan, which recognizes that integrating ICT into education means tackling issues of content, access, and competency, as well as incorporation of ICT into the processes of teaching and learning. This requires both teachers and students to be competent users of the available technologies. However, there was a significant gap in the plan regarding teacher development in ICT integration. Therefore, the ICT Professional Development Strategy for Teachers was developed.

This paper reports on the process used to redesign the teacher training curriculum in

Guyana to achieve the goals of a newly-developed ICT Professional Development Strategy and outlines key lessons learned. The UNESCO ICT Competency Framework for Teachers (CFT) was central to the redesign process, and was used to review and reorganize the national teacher education curriculum aimed at pre-service teachers. The framework also influenced plans to provide professional development for in-service teachers, and influenced the selection of Open Education Resources (OER) used to develop a new learning environment and the accompanying learning materials for the teaching of ICT in Education.

ICT Professional Development Strategy for Teachers and the UNESCO ICT CFT

The ICT Professional Development Strategy for Teachers is a comprehensive framework and learning pathway for Guyana managers, teacher educators, teachers, student teachers, and administrators to become competent in using ICT to support high-quality teaching and learning.¹ The various strands of capacity building identified within the strategy have been heavily influenced by the UNESCO ICT CFT. As the UNESCO ICT CFT is pivotal to understanding the strategy, it is important to appreciate its structure.

The ICT CFT provides a framework from which a national ICT in education curriculum can be created. The framework identifies three sets of ICT competencies, each set growing in sophistication. The competencies, when assimilated into teacher practice, enhance a teacher's ability to perform in the following education settings:

- Education policy
- Curriculum and assessment
- Pedagogy
- ICT
- School organization and administration
- Teacher professional development.

Significantly, instead of encouraging learning ICT applications for their own sake, the framework provides a solid educational context to develop ICT skills and competencies.

The framework is structured so that teachers revisit each theme as they progress from one set of competencies to the next and as their proficiencies improve. The first set, Technology Literacy, encourages skills and understanding at a basic level, specifically awareness of how ICT can add value in the education setting. The second set of competencies, Knowledge Deepening, encourages application of ICT skills and know-how into the education process. The third and final set, Knowledge Creation, calls teachers to become innovators and users of ICT in new and novel ways.

The diagram below illustrates how the ICT Strategy for Teacher Development sees the UNESCO ICT CFT informing various training options offered by the principal teacher training institutions in Guyana: the Cyril Potter College of Education (CPCE) and the Faculty of Education, University of Guyana (UG). The College's advanced diploma incorporates courses that cover competencies at the Technology Literacy level, while courses within the university degree addresses competencies at the Knowledge Deepening levels of the UNESCO framework. The framework is also pivotal to the services offered to in-service teachers as coordinated by National Centre for Educational Resource Development (NCERD). Here, continuing professional development short courses offer training within all three bands, with only teachers who have had a number of years teaching experience and exposure to ICT studying at the Knowledge Creation level.

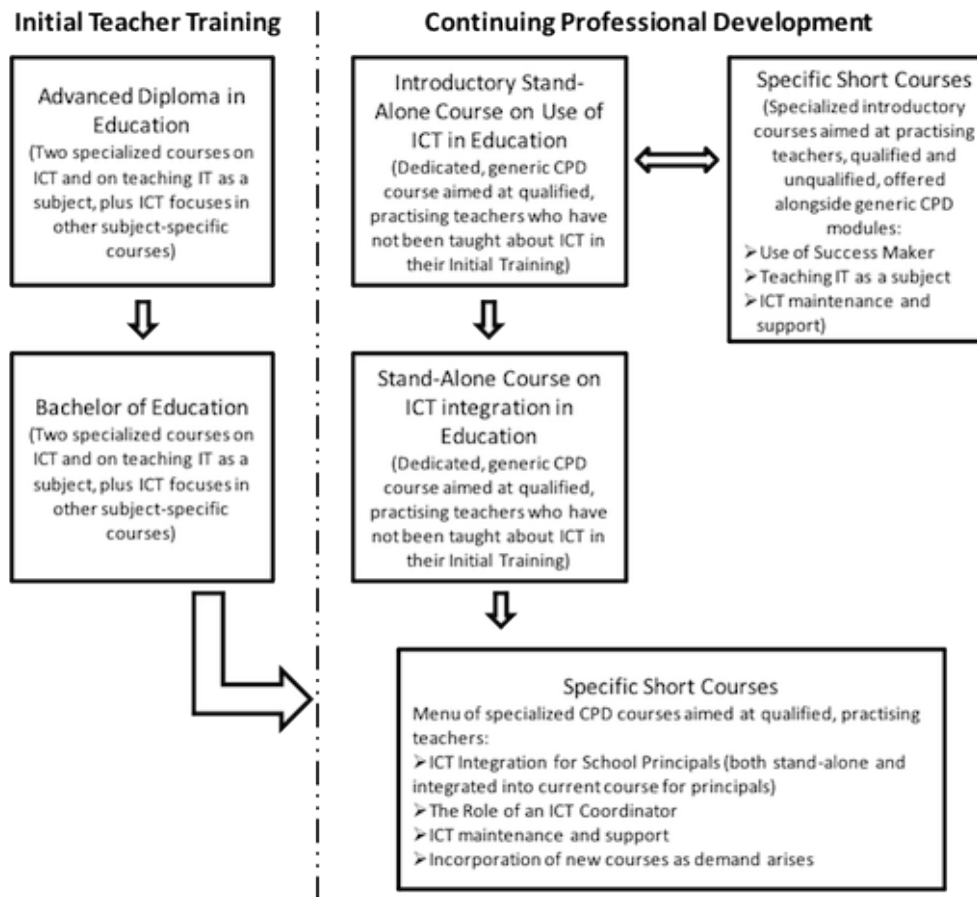


Fig. 1: ICT Integration Curriculum Roadmap for Guyana

Curriculum Review and Redevelopment

One of the activities required within the strategy was to review existing local ICT in Education curricula. Both the College of Education and the University had curricula, but an evaluation showed that they worked in isolation and had very different approaches to the subject. As a consequence of the requirements of the professional development strategy document, it was instead decided to draw extensively on the UNESCO ICT CFT so that both colleges and universities could build teacher ICT competencies in a coherent and sequential manner, allowing them to master ever more sophisticated ICT skills and know-how.

A new four-year ICT in the Education curriculum that pre-service teachers study at both the College and later at the University level (Associate and Bachelor of Education Degrees) has been devised and is shaping teacher education. While adapted to suit local needs and contexts, the curriculum document explicitly indicates where it addresses competencies identified within the UNESCO ICT CFT.

Table 1. An excerpt from the Guyana ICT in Education curriculum document

Topic	Objectives				Content	Act Ma
	Skills	Knowledge	Understanding	Attitude		
Year 2 Associates Degree - Technology Literacy – Pedagogy - Unit 8						
<i>Integrating</i>	Integrate ICT into didactic teaching methodologies	Know how to use technology to enhance teacher centered	Understand differences between didactic and constructivist methodologies	Wants to exploit technology to make teaching materials	Brief introduction to didactic methodology and then some	See 1. 1 Moc Uni ICT Ed.

ICT into didactic teaching methodologies		lessons		more appealing to students	consideration on how ICT can enhance this methodology. Examples of ICT use to suit various objectives.	for Teachers' Core ROI
UNESCO ICT CFT Objective: Describe how didactic teaching and ICT can be used to support students' acquisition of school subject matter knowledge. (TL.3.a)						

Materials Development Process: Harnessing OER

Another innovation of the strategy's implementation was the development of ICT in Education Teachers course and materials. The process of compiling the course of 60 hours for Technology Literacy and 90 hours for Knowledge Deepening competencies encouraged a new approach, which involved intensive use of OER. This is discussed below.

Selecting OER

Guided by the curriculum, a four-person, part-time development team conducted an Internet search for potential resources, but particularly OER. Generally, openly licensed teacher education resources are readily available, but the development team found that at that time few were created specifically with the UNESCO ICT CFT in mind.

In addition to identifying OER, the developers also determined the quality and suitability of each resource, as well as the amount of repurposing required to adapt it for the Guyana context. As far as possible, resources that required little repurposing were selected.

An additional complication was that some open licences limited how and to what extent a resource could be used. For example, some resources had a licence prohibiting any repurposing, on occasion making it unusable. In the few instances where a copyrighted work was deemed indispensable, copyright permission was secured to reproduce the work, and all copyright conditions were honoured.

Responding to Local Context and Needs

A rich set of open and/or free resources was identified. Facilitation guides were then developed to outline suggested use of the OER in order to achieve each of the ICT competencies as expressed in the curriculum. Initially, these guides were designed for distribution as paper-based materials because initial research had suggested connectivity and access to ICT could not be guaranteed in rural areas.

The course was piloted with stakeholders in Guyana to test the assumptions of the development team. Initial feedback from CPCE staff, as well as comments and suggestions from UG staff, were collected and collated to inform revisions to the course materials. For example, during the first round, the reviewers immediately called for a version of the course that could be accessed from a CD-ROM, with all the OER stored on the disk, eliminating the need for connectivity. Consequently, both paper and electronic versions were developed. The CD version was aimed directly at the students rather than at the lecturing staff, and, hence, became teaching materials rather than guides.

In the second review, a suggested assessment strategy incorporating the development of a portfolio of digital artefacts and a mock examination was requested and added.

Development Model

The ease with which changes and modifications could be made was facilitated in part by using a quick and cheap development cycle that took advantage of the available electronic materials, user friendly digital tools, and OER. The nature of any ICT in Education courses means that digital tools and content are constantly evolving and changing. Consequently, they also demand repeated evaluation and updating. The course development model in this project came to approximate what some open source software designers use for the development of software: "Release Early, Release Often" (RERO)². The rationale for this is that, only once the product is deployed and developers receive user feedback, can it truly be customized to suit user needs. In this model, more reviewer or user feedback makes it

easier to eliminate problems. Regular cycles of testing and revision align the product quickly and cost-effectively with user needs.

There are additional advantages to this approach. Besides responding rapidly to user feedback and creating 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 materials allows for quick and cost-effective changes to content. Course components can be replaced easily without affecting those components that are still required. Additionally, as new tools such as social networking, productivity or utility tools, become available, these can be accommodated in the existing design with minimal disruption.

As a consequence of this development model, it was easy to customize the pre-service ICT in Education modules and repurpose them for in-service teachers. The in-service version of the course is available for NCERD's continuing professional development programme. It was also easy to develop the materials for distribution in different modes: paper and digital.

Deployment

The Associate and Bachelor of Education Degrees, offered by CPCE and UG, have two complete professional development modules (influenced by the ICT CFT), one focused on 'Technology Literacy' and another on 'Knowledge Deepening'. Through several workshops, selected staff in those institutions were trained to support deployment of the course.

These modules were successfully integrated into pre-service teacher education programmes at CPCE and UG, as part of the wider Guyana Improving Teacher Education Project (GITEP).

1. At CPCE, the modules were deployed in 2011 and 2012, to groups of around 200 students in each year. The first module was delivered to approximately 350 students in 2013. In addition, CPCE is offering a Foundational ICT Literacy module for students with no prior exposure to ICT, teaching them the basics of using ICT.
2. At UG, the modules were implemented through Science and Technology subjects, and were delivered to approximately 125 students during 2012. Encouragingly, approximately 25 students completed ICT Integration projects, demonstrating leadership as potential ICT champions within their schools.
3. At NCERD, the module on Technology Literacy was delivered to in-service teachers during holiday workshops.

Lessons Learned

Many lessons were learned during implementation of the Guyana ICT Professional Development Strategy for Teachers and the materials development process. The most noteworthy are highlighted below.

The Importance of People

Despite a national context where technology and connectivity were not ubiquitous, the Guyana Ministry of Education was farsighted in its realization that, at the core of this transformation, was not the technology itself but rather the people who would be expected to use it. These people can be found at all levels within the education sector: the Ministry of Education, agencies, teacher training institutions, and the schools themselves. Consequently, the strategy was developed around advocacy and the need to build human capacity rather than an exclusive focus on technology.

Importance of Leadership Support

High-level support of the initiatives is key for success, and there would also be merit in establishing a committee to bring key stakeholders and their interests together for successful implementation.

Understanding the Context

Despite current advances in e-learning that see ICT being used in increasingly sophisticated ways, the most appropriate use of ICT should be assessed within the context in which it will be used and, in particular, considering infrastructural issues and human capacity. An ICT infrastructure is necessary if a professional development initiative like this one is to succeed. However, in this particular instance, paper-based materials were regarded as possibly more

useful than an electronic version because both access to ICT and familiarity with the tools are still limited for many students and teachers.

Importance of an Inclusive Design Process

Consulting as many stakeholders as possible was valuable, particularly in the design process. For example, the process of consultation around evaluation of the materials and course design with representatives from CPCE and UG was particularly beneficial. The use of OER was promoted through discussions about interpretations of 'open' in lesson design, and stakeholders were encouraged to present derivatives of the lessons presented on the CD in order to facilitate deeper understandings of OER and the ICT competency being developed within the lesson. Such approaches empowered stakeholders to understand how OER works and to undertake similar steps in their own course design.

Using Existing Frameworks

The UNESCO ICT CFT provides an excellent point of reference for the creation or refinement of course development strategies. However, it cannot be assumed that teacher education providers have the necessary skills to develop, adapt, and implement courses aligned with it. Thus, some seed funding is likely needed to initiate activities to support technical assistance and capacity building to integrate the strategy into existing processes. Additionally, communication, advocacy, and a defined monitoring and evaluation strategy are important to support the process.

Cost Benefits of Using OER

OER can offer a cost-effective route to acquiring quality teaching and learning materials, especially in environments where resources are in short supply. It is not, however, a simple shortcut to the normal materials development process. Time, skill, and creativity are required to rework the materials to satisfy a specific set of objectives identified by a curriculum committee or body. Nevertheless, a significant lesson learned during the Guyana implementation is the cost benefit of adopting an open model. Table 2 provides a breakdown of the costs of developing the Technology Literacy module.

Table 2. Time and costs of developing the Technology Literacy Module

Development Team	Time (days)	Costs (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

The Technology Literacy module lasts approximately 70 hours, whilst the Knowledge Deepening module lasts approximately ninety hours. It took 76 days (or 608 hours) to produce 160 hours of learning (of which 80 are effectively text- or print-based and eighty are computer-based instruction).

Table 3 shows the time estimates provided by Swift (1996; cited in Butcher & Roberts, 2004) for the design of courses at first-year university level.

Table 3. Time taken to design one notional hour of student learning time³

Media	Hours
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Print	20–100
Audio	20–100
Video	50–200
Computer-based instruction	200–300
Experiments	200–300

Table 4 shows the average design times — provided by Bryan Chapman of Brandon-Hall — to create one hour of training.

Table 4. Average design times for one hour of training⁴

Material Type	Average Hours
Instructor-led training (ILT) , including design, lesson plans, handouts, PowerPoint slides, etc.	34
PowerPoint to eLearning conversion	33
Standard eLearning , which includes presentation, audio, some video, test questions, and twenty per cent interactivity	22
Third-party courseware . Time it takes for online learning publishers to design, create, test, and package third-party courseware	345
Simulations from scratch; creating highly interactive content	750

Table 5 compares Swift's (1996; cited in Butcher & Roberts, 2004) estimates of time to design one notional student hour of learning with the actual time taken to develop the Guyana materials.

Table 5. Comparing Guyana design with Swift's notional estimates

Media	Swift's notional estimate of time required to produce material equivalent to one notional learning hour	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 are estimates for distance education course development and the Guyana courses are a blended learning design, it is possibly more useful to compare the costs with the notional estimates from Bryan Chapman (in Clark, 2010). As shown in Table 6, the result is no less significant.

Table 6. Comparing Guyana design with Chapman's notional estimates

Media	Chapman's notional estimate of time required to produce material equivalent to one notional learning hour	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 , including presentations, audio, some video, test questions, and 20% interactivity	22 hours	3.8 hours

These figures do not reflect another 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 generated eight versions of content:

- 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 licence, 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 Dominica, Indonesia, Kenya, and Oman, where it is being redeployed with marginal redevelopment time required to contextualize the materials effectively.

However, 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 multitasking has been facilitated by the growing access to content development tools provided by ICT, but also suggests that effective economic use of OER for course design and development requires highly skilled designers.

Transferability

All the tools used to develop the professional development strategy, devise the UNESCO ICT CFT influenced ICT in Education curriculum, and build the ICT in Education course and its materials have been released as an open licence ICT in Education Teacher's Professional Development Toolkit.⁵ The Guyana ICT in Education Teacher's Course in all its different manifestations and versions can be accessed online and repurposed for other contexts.⁶

The ICT in Education course has already shown evidence of being co-opted and adapted for

new purposes. In 2014, the Guyana materials were accessed separately by Kenyan and Omani educators tasked with developing ICT in Education courses for in-service teachers. They, too, are using the UNESCO ICT CFT as their guiding framework and are looking to adapt OER for this purpose. Both teams are customizing the Guyana materials and reworking them so that they have many more interactive elements and can be distributed online using a Learner Management System. The open licensing of the Guyana materials provides scope for repurposing. The latest manifestation of the ICT in Education course will also be offered back to the open education community with its additional enhancements.

Conclusion

The Guyana ICT Professional Development Strategy for Teachers initiative has had many positive benefits. 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. Feedback from stakeholders indicated that the project went some way towards achieving the ICT vision articulated by the government by encouraging the next generation of teachers to improve ICT competencies by using ICT for educational purposes. It also encouraged teachers to adopt new teaching strategies, and has opened opportunities to consider the important role of adapting OER to promote a learner-centric approach in the future.

The initiatives designed to build educators' capacity illustrate that digital resources, such as the UNESCO ICT CFT and OER, as well as many of the ICT tools available, add value rather than simply adding to existing responsibilities. After an initial investment of time and resources, ICT will lead to improved productivity, enhanced teaching and learning, and more effective administration and communication channels. The Guyana ICT Professional Development Strategy for Teachers illustrates a potential pathway to achieving a transformation.

Footnotes

1. The Guyana ICT Strategy for Teacher Development can be accessed in full online at <http://www.ccti.colfinder.org/toolkit/ict-toolkit/pages/06.html>
2. See Wikipedia: http://en.wikipedia.org/wiki/Release_early_release_often
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6. See the pre-service Guyana ICT in Education Teacher's Course at http://colccti.colfinder.org/sites/default/files/PreService_International/index.html

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