

SURVEY OF ICT AND EDUCATION IN THE CARIBBEAN VOLUME II: COUNTRY REPORTS

An *infoDev* PUBLICATION PREPARED BY:

Edmond Gaible, PhD
The Natoma Group

ICT AND EDUCATION SERIES


SERIES EDITOR:
Michael Trucano

*A Summary Report Based on
16 Country Surveys: Anguilla,
Antigua and Barbuda, Aruba,
Barbados, British Virgin
Islands, Cayman Islands,
Dominica, Grenada, Jamaica,
Montserrat, St. Kitts and Nevis,
St Lucia, St. Vincent and the
Grenadines, Trinidad and
Tobago, Turks and Caicos
Islands, U.S. Virgin Islands*



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The World Bank
1818 H Street NW
Washington DC 20433
Telephone: 202-473-1000
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E-mail: feedback@worldbank.org

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These short Country Reports, the result of the larger *infoDev*-supported *Survey of ICT in Education in the Caribbean*, provide general overviews of current activities and issues related to ICT use in education in Caribbean countries. The data presented here should be regarded as illustrative rather than exhaustive. ICT use in education is at a particularly dynamic stage in the Caribbean; new developments and announcements are happening somewhere in the region on a daily basis. Therefore, these reports should be seen as "snapshots" that were current at the time they were taken; it is expected that certain facts and figures presented may become dated very quickly. The findings, interpretations and conclusions expressed herein are entirely those of the author and do not necessarily reflect the view of *infoDev*, the Donors of *infoDev*, the World Bank and its affiliated organizations, the Board of Executive Directors of the World Bank or the governments they represent. The World Bank cannot guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply on the part of the World Bank any judgment of the legal status of any territory or the endorsement or acceptance of such boundaries. It is expected that individual Country Reports from the Survey of ICT and Education in the Caribbean will be updated in an iterative process over time based on additional research and feedback received through the *infoDev* web site. For more information, and to suggest modifications to individual Country Reports, please see www.infodev.org/ict4edu-Caribbean.

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Table of Contents

Acronyms	v
Limitations of this report	ix
Acknowledgements	xi
Anguilla	1
Antigua and Barbuda	5
Aruba	9
Barbados	13
British Virgin Islands	19
Cayman Islands	25
Dominica	31
Grenada	35
Jamaica	39
Montserrat	47
St. Kitts and Nevis	51
St Lucia	55
St. Vincent and the Grenadines	61
Trinidad and Tobago	65
Turks and Caicos Islands	71
Virgin Islands, United States Territory	75
Glossary	81



Acronyms

ABHTI	Antigua and Barbuda Hospitality Training Institute
ABIIT	Antigua and Barbuda International Institute of Technology
ADSL	Asymmetric Digital Subscriber Line (also DSL)
BSSEE	Barbados Secondary School Entrance Exams
BVI HS	British Virgin Islands High School
C & W	Cable and Wireless Corporation
CAI	Computer-assisted Instruction
CAPE	Caribbean Advanced Proficiency Examination
CARADOL	Caribbean Association for Distance and Open Learning
CARICOM	Caribbean Community
CASE	College of Agriculture, Science and Education
CDB	Caribbean Development Bank
CIC	Community Information Center
CKLN	Caribbean Knowledge and Learning Network
CMC	Community Media Center
COL	Commonwealth of Learning
COTS	Commercial Off-the-Shelf
CREMIS	Caribbean Regional Education Management Information System
CSEC	Caribbean Secondary Education Certificate
CUPIDE	Caribbean Universities Project for Integrated Distance Education
CXC	Caribbean Examination Council
DBMS	Database Management System
DE	Distance Education
DFID	Department for International Development
DOE	Department of Education
ECCB	Eastern Caribbean Central Bank
EDF	European Development Fund
EEC	Education Evaluation Center
EFA	Education For All
ELJAM	e-Learning Jamaica
EMIS	Education Management Information Systems
ETRC	Education Technology Resource Centre
FCC	Federal Communication Commission
GCE	General Certificate of Education
GeSCI	Global e-Schools Initiative
GIS	Geographic Information System
GOB	Government of Barbados
GER	Gross Enrollment Ratio
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
HDI	Human Development Index (UNDP)
HEART Trust/NTA	The Human Employment and Resource Training Trust/National Training Agency
HLSCC	H. Lavity Stoutt Community College
ICCI	International College of the Cayman Islands

ICDL	International Computer Driving Licenses
ICT	Information and Communications and Technology
IDB	InterAmerican Development Bank
IDRC	International Development Research Centre
IGCSE	International General Certificate of Education
IEARN	International Education and Resource Network
IP	Internet Protocol
IPA	Pedagogical Institute of Aruba
ISTENETS	International Society for Technology in Education National Education Technology Standards
IT	Information Technology*
ITALIC	Improving Teaching and Learning in the Cayman Islands
JCSEF	Jamaica Computer Society Education Foundation
JSAS	Jamaica School Administration Software
JSEP	Job Skills Education Program
LAN	Local Area Network
LDC	Least Developed Country
LRC	Learning Resource Center
LMS	Learning Management System
MIT	Massachusetts Institute of Technology
MOE	Ministry of Education
MOE Barbados	Ministry of Education, Youth Affairs and Sports
MOEY	Ministry of Education and Youth (Jamaica)
MOEYC	Ministry of Education, Youth and Culture (Jamaica)
MOEYS	Ministry of Education, Youth, and Sports
NCU	Northern Caribbean University
NIHEST	National Institute of Higher Education, Science and Technology
NHP	New Horizons Project
NQR	National Qualifications Register
OAS	Organization of American States
OCAD	Ontario College of Art and Design
OCW	Open CourseWare Project
ODL	Open and Distance Learning
OECS	Organisation of Eastern Caribbean States
OER	Open Education Resource
OERU	OECS Education Reform Unit
OISE	Ontario Institute for Studies in Education
OLPC	One Laptop Per Child
PBL	Project-based Learning
PBX	Private Branch Exchange
PDU	Professional Development Unit
PSEP	Primary Education Support Project
PMT	Performance Management Tool
PPP	Pillars for Partnership and Progress: The OECS Education Reform Strategy 2010
PPMR	Project Performance Monitoring Report
PTA	Parent Teachers Association

* While the acronym "ICT" is the term of art used most commonly among donor and development agencies, MOEs and other educational institutions in the Caribbean (and elsewhere) use "IT," especially in relation to curricula, exams, departments within ministries, and technology teachers. To the extent possible, IT will be used similarly in this report. ICT will be used more generally.

SALCC	Sir Arthur Lewis Community College
SASI	School Administrative Student Information
SBA	School-based Assessment
SEMP	Secondary Education Modernization Program
SETAR	Servicio di Telecomunicación di Aruba
SIDS	Small Island Developing States
SIF	Schools Interoperability Framework
SIFA	Schools Interoperability Framework Association
SITES M2	Second Information Technology in Education Study: Module 2 report
SJPP	Samuel Jackman Prescod Polytechnic
SMU	St. Mathews University
TCO	Total Cost of Ownership
TIMS	Training Information Management System
TLI	Tertiary Level Institution
TPD	Teacher Professional Development
TVET	Technical and Vocational Education and Training
UCCI	University College of the Cayman Islands
UNDP	United Nations Development Program)
UNICEF	United Nations Children's Fund
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States of America
USAC	Universal Service Administration Company
USAID	United States Agency for International Development
USED	United States Department of Education
UTech	University of Technology
UVI	University of the Virgin Islands
UWI	University of the West Indies
UWIDEC	University of the West Indies Distance Education Centre
UWISCS	UWI School of Continuing Studies
VIDE	US Virgin Islands Department of Education
VOIP	Voice Over Internet Protocol
VSAT	Very Small Aperture Terminal
VTC	Video teleconference
VUSSC	Virtual University of the Small States of the Commonwealth
WAN	Wide Area Network



Limitations of this report

The following limitations should be noted:

- The data presented in the individual *Country Reports* should be regarded as illustrative rather than exhaustive. This *Survey* was not an exercise in primary data collection. The guidelines given to country researchers regarding report length were deliberate in order to ensure a focus on the more salient information and to enable the completion of the project within the established time frame and the available resources.
- Focus on regional trends and national profiles have no doubt failed to identify effective small-scale projects. Review methodology focused on secondary research and on interviews with respondents in positions that enabled them to knowledgeably discuss system-wide aspects of Information and Communications Technology (ICT) in schools and education systems, and recent or significant government projects and programs.
- Consideration of the cost effectiveness of ICT use in education has not been undertaken in the course of the *Survey*. While such analysis is critical to understand decision-making especially in relation to opportunity costs, this analysis is beyond the scope outlined for the *Survey*.
- The main focus of research for the *Survey* has been the use of ICT use in primary and secondary education, with additional investigation of ICT use in tertiary, vocational, and non-formal education. Many important aspects of the use of ICT in schools and in other learning-related contexts have not been addressed in the *Survey*. These include topics that cover services for special-needs students, assistive technologies, and providing ICT access to isolated and vulnerable populations, among others.
- ICT use in education is at a particularly dynamic stage in the Caribbean, which means that there are new developments and announcements happening on a daily basis. Therefore, these reports need to be seen as “snapshots” that were current at the time they were taken; it is expected that specific facts and figures presented in the *Country Reports* may become dated very quickly.
- It is anticipated that these reports will serve as the building block for an on-line database that will be updated collaboratively over time, based on additional research and feedback received through the *infoDev* web site. It is expected that individual *Country Reports* will be updated in an iterative process over time based on additional research and feedback received through the *infoDev* web site. For more information, and to suggest modifications to individual *Country Reports*, please see www.infodev.org/ict4edu-Caribbean.



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■ Worrell Brooks
Deputy Principal, Curriculum
Albena Lake-Hodge Comprehensive School
Anguilla

■ Leo Cato
Education Officer, IT
Ministry of Education
Grenada

■ Albert Corcho
Principal, Tarrant High School
Jamaica

■ Jacqueline Cousins
Assistant Chief Education Officer
Media Services Unit
Ministry of Education and Youth
Jamaica

■ Averill Crawford
Chief Executive Officer/Project Manager
e-Learning Jamaica
Jamaica

■ Susan Dougan
Chief Education Officer
Ministry of Education, Youth and Sports
St. Vincent and the Grenadines

■ Abraham Durand
Director, ICT Division
Ministry of Education
Dominica

■ Doristeen Etinoff
Assistant Director of Education
Ministry of Education
Antigua and Barbuda

■ Chris Gilbert
Ministry of Education
Jamaica

Interview respondents

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St. Lucia

- Soila M. Gomez-Vries
Project leader, ICT
Ministry of Education and Labor
Aruba
- Kathleen Greenaway
Director of Education
Ministry of Education and Labour
Montserrat
- Hon. Girlyn Miguel
Minister of Education, Youth, and Sports
St. Vincent and the Grenadines
- Hon. Dr. Carlton Mills
Minister of Education, Youth, Sports and Culture
Ministry of Education
Turks and Caicos Islands
- Quinton Morton
Director EMIS
Ministry of Education
St. Kitts and Nevis
- Marlon Narcisse
Manager, IT Unit
Ministry of Education, Human Resource
Development Youth and Sports
St. Lucia
- Robert Phillips
Education Specialist
e-Learning Jamaica
Jamaica
- Keith Ramlakhan
Education Officer for Curriculum and
Technology
Ministry of Education
Trinidad and Tobago
- Mark Ray
Program Director
Education Sector Enhancement Program,
Ministry of Education
Barbados
- Dawn Reid
Education Planner
Department of Education
Anguilla
- Matthew Richardson
Sr. Systems Engineer
Department of IT and E-Government Services
Anguilla
- Richard Robinson
Education Planner
Ministry of Education
Turks and Caicos Islands
- Lorna Rowe
Executive Assistant to the CEO
e-Learning Jamaica
Jamaica
- Ilonka N. Sjak-Shie
Founder, School of Tomorrow
Pedagogical Institute of Aruba
Aruba
- Tyrone Smith
Education Officer (ICT)
Department of Education
British Virgin Islands
- Clinton Stapleton
Director
Territorial Office of Instructional Technology
Department of Education
US Virgin Islands
- Hassan Syed
President
University College Cayman Islands
Cayman Islands
- Denzil West
Director for Government Information Systems
Ministry of Finance
Dominica

About the author

Edmond Gaible, PhD, president of The Natoma Group, is a consultant in ICT for development based in Oakland, California, specializing in teacher development, technology integration, and in appropriate technology and sustainable solutions. Over the last ten years, he has worked with governments, development agencies, foundations, and local NGOs on projects in Africa, Asia, and Latin

America. In 2006, with Mary Burns, he wrote the *infoDev* guide, *Using Technology to Train Teachers*.

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Anguilla

Summary

Despite limited resources, the Government of Anguilla and the MOE have been successful in ensuring that all schoolchildren have the opportunity to gain basic ICT skills and that all secondary students have the opportunity to reinforce and develop those skills. Lack of hardware and the poor quality of hardware at the primary level, in combination with other challenges, have created barriers to access of ICT by teachers and students. Although teachers tend to have basic ICT skills and enthusiasm for the use of computers, and the MOE has adequate knowledge and technical capacity, access limitations render integration of technology into the curriculum or EMIS implementation infeasible at present.

Anguilla is not among the Caribbean's high-income or high-growth economies. Expansion of the tourism sector has led to growth in construction, but has reduced the labor pool for agriculture. Despite economic and other limitations, however,

the school system has been able to provide all students with the opportunity to develop ICT skills. The need to meet a minimum standard of hardware quality and computer and Internet access remains a substantial and unmet challenge.



Basic Data

Category	Date	Value
Population	2006	13,477
Per capita GDP (PPP)	2005	\$8,800
Economy, composition	2006	Tourism, construction, fishing (lobster), financial services
Literacy, total population 15 and over	1985	95%
Literacy rate (women)	1985	95%
Gross enrollment ratio, primary	2002/3	99.9
Gross enrollment ratio, primary (girls)	2002/3	100.6
Gross enrollment ratio, secondary	2002/3	108.3
Gross enrollment ratio, secondary (girls)	2002/3	108.2
Number of primary schools	2007	6
Number of secondary schools	2007	1
Language of instruction	—	English

Sources: World Factbook, UNESCO, MOE

Relevant Policies

Document	Status	Date	Key points and objectives
Policy on ICT in Education	Adopted	2003	<ul style="list-style-type: none"> ■ Unknown (Similar to OERU template)
Five-Year Education Development Plan 2005–2010	Draft	2004	<ul style="list-style-type: none"> ■ Increased use of ICT for teaching, learning and communication as a means of curriculum renewal ■ Improved computer maintenance in schools as a means of increasing use of ICT
The Establishment of a Tertiary Education College in Anguilla	In process	2003	<ul style="list-style-type: none"> ■ Students wishing to acquire ICT-focused certification and degrees will form part of the enrolled population ■ The community college may offer non-credit computer literacy courses
Anguilla Telecommunications Policy	Adopted	2004	<ul style="list-style-type: none"> ■ ICT can provide access to higher-quality education to students in remote areas ■ ICT facilitates lifelong learning

Sources: MOE, The Natoma Group

Policy and planning

The ICT Policy for education in Anguilla was developed in collaboration with OERU, using the OERU policy template. The impact of that policy has primarily been in supporting increased acquisition of educational software. Respondents within the MOE have suggested that as circumstances have changed both in Anguilla and with regard to developments in technology, the ICT policy should be revisited.

With DFID support, the MOE prepared a draft five-year plan in 2004. That plan does not emphasize use of ICT in relation to goals outside the IT curriculum or to system enhancements. However, ICT is cited generally as an engine for enhancing the curriculum and as a means of improving teaching, learning, and communication.

The MOE's IT Unit in addition has developed policies guiding procurement, ergonomically sound

installation, and other activities critical to the use of ICT in schools.

ICT in schools

The Government of Anguilla has been able to provide access to ICT across the school system, and to ensure that all students starting at ages 9 to 10 years old develop basic computing skills.

Challenges center on hardware maintenance and the age of computers, which combine to limit computer access by teachers and students. Eighty computers (over 50 percent of the total number of computers in schools) were received in 2003 as refurbished donations from the Mount Sinai School District, New York. (Mount Sinai is a residential community on the north shore of Long Island.) The MOE and the IT Unit have established strict quality-assurance protocols for donated and refurbished hardware, and

ICT Resources in Schools

School type	Number	Enrollment	ICT profile
Public primary schools	6	~100–400 students	<ul style="list-style-type: none"> ■ One lab per school ■ 12–15 computers per lab ■ 512 kbps ADSL Internet
Public secondary school	1 school, with junior and senior campuses	~800 students	<ul style="list-style-type: none"> ■ Junior campus has 1 lab with 26 computers ■ Senior campus has 4 labs of roughly 30 computers ■ 512 kbps ADSL Internet

Source: MOE

the computers were in reasonable condition when they were received. Nonetheless, it has become increasingly difficult to maintain these machines in useable condition.

Primary schools

Primary-school classes of 25 to 30 students use school labs of 12 to 15 computers, creating a student-to-computer ratio of approximately 2:1. Students typically learn basic computing skills and use educational software to address subjects such as math, language arts, and science. Internet connectivity (512 kbps via ADSL) is adequate for current needs.

As more children have computers in their homes, the need to ensure equitable access to ICT for all children in Anguilla has become more pressing. In schools, knowledgeable students being paired with those with less understanding has emerged as one method for supporting broad-based skills development.

Secondary school

Secondary students in Anguilla attend a single high school, however that school has both a junior campus and a senior campus.

The junior campus has one computer lab of 26 computers. The main use of this lab is to enable students to advance their use of ICT; all students have access to the lab.

The senior campus has four labs of approximately 30 computers each. Students use three of these labs to prepare for the CXC IT exam. The fourth lab offers Computer-aided design (CAD) software and other advanced tools, and is dedicated for use by students planning to pursue careers in ICT.

Internet connectivity—again 512 kbps ADSL—has been extended to only one lab. However, usage by students in that lab is high, and the connection is not adequate.

Maintenance

As mentioned, hardware maintenance is the greatest near-term challenge faced by the MOE in terms of ICT use in schools. In combination with the government's IT Unit, MOE has established quality-assurance protocols, in which refurbished computers must meet a minimum hardware specifica-

tion and level of functionality. Those protocols notwithstanding, computers from the initial donation are increasingly difficult to maintain.

At present, maintenance-and-repair personnel in the IT Unit respond to requests on an as-needed basis, dispatching repair teams within 24 hours of calls from principals or teachers. During periods just prior to exams, requests typically increase, resulting in increased delays in response time.

Near-term plans

The MOE is in the process of procuring 70 computers to replace refurbished computers that are now well out-of-date and that present the most significant maintenance challenges.

One of the barriers to effective maintenance—in addition to lack of adequate staffing of the IT Unit's maintenance team—is lack of access to replacement parts. Given the array of heterogeneous and out-of-date hardware currently in primary schools, MOE does not keep in inventory compatible replacement hardware components. As a result, when the IT Unit receives non-functioning computers from schools, repairs then typically involve ordering replacement parts internationally, then completing repairs when those parts are available.

Teacher professional development

Anguillan teachers currently gain basic ICT skills as part of their pre-service general education. Teachers are generally enthusiastic about adopting ICT to enhance teaching and learning, and generally have adequate skills. Primary teachers have completed high school; secondary teachers are typically A-level graduates at a minimum, with many holders of B. Ed. degrees as well.

In-service TPD is offered to teachers periodically to address special topics such as PowerPoint and desktop publishing.

Access to computers in schools, however, is an initial barrier that must be addressed before curriculum development or TPD can effectively support integration of technology into the curriculum.

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
In-service MOE workshops	In-service primary and secondary teachers	■ Help teachers gain additional skills (e.g., PowerPoint, desktop publishing, etc.)	■ Open to all teachers on a volunteer basis	■ Access to ICT in schools limits demand and effectiveness of TPD
In-service ICT-focused TPD (discontinued)	In-service primary and secondary teachers	■ Ensure that when computers were introduced, teachers were familiar with them	■ All in-service teachers	■ Access to ICT

Source: MOE

Tertiary education

The Government of Anguilla has launched development of a community college, which is scheduled to open in five or more years (depending on access to funding). Current plans call for the establishment of a division of natural sciences, which will house a department of IT or computer science.

EMIS and the use of technology within MOE

The Anguillan MOE has taken steps to implement EMIS, however these steps have yet to lead to implementation. Collaboration with OERU has led to development of an initial database. However, input of data has lagged.

As in many countries in the region, barriers to EMIS implementation include lack of funding and human resources, lack of access to ICT at the school level, and challenges in terms of communication and TPD. (One respondent suggested that the key missing element is “Commitment!”)

Regional collaboration and technical assistance, if properly conceived, would be welcomed supplements to the Anguillan efforts to implement EMIS.

Barriers and challenges

The chief barriers and challenges confronting ICT use in education in Anguilla revolve around access. Limited funding, older hardware, and inadequate maintenance combine to render more advanced use of ICT by teachers, students, and administrators infeasible.

- **Lack of funding and resources:** Sources of funding for education in Anguilla vary from year to year. In the 2006–2007 fiscal year, in the absence of funding for special projects, the government funded primary and secondary education. DFID has provided funding in prior years. In any event, a large proportion of out-of-date refurbished computers coupled with limited numbers of computers overall restricts both teacher and student access to ICT. Limited access makes development of plans or curricula that take greater advantage of ICT pointless at present.
- **Inadequate maintenance:** As described, maintenance challenges include a high percentage of older, refurbished computers, lack of inventory of spare parts, and lack of staff.

The barriers described here preclude more ambitious planning for ICT use in schools despite the presence of both human and technical capacity within MOE, and despite the acknowledged need to ensure that Anguillan students do not lag students regionally and internationally in terms of competitiveness in the global economy.

Antigua and Barbuda

Summary

The country of Antigua and Barbuda has introduced computers and the Internet in secondary schools in support of students' preparation for the CXC IT exam. An initiative placing three to four computers in six primary schools, with the intention of supporting younger students' early familiarization with computers, is also in process. In addition, the MOE is conducting a three-school pilot test of AbusSTAR, the Barbadian EMIS tool.

Policy and planning within the MOE have fallen behind these modest in-school efforts and behind developments in the field of ICT in education as well. With no solid link to strategy or to broader goals, Antigua's modest activities combine only loosely to enhance the delivery of education or the quality of teaching and learning in schools.

The economy of Antigua and Barbuda is heavily dominated by tourism, with additional revenues generated by assembly of goods ranging from

electronics components to mattresses. Agricultural production is intended for domestic sales.

Over the past 10 years, efforts to support ICT in education have focused on upper-secondary students'



Basic Data

Category	Date	Value
Population	2006	69,108
Per capita GDP (PPP)	2005	\$10,900
Economy, composition	2006	Tourism, manufacturing (assembly), agriculture
Literacy, total population 15 and over	2003	85.8%
Literacy rate (females)		NA
Gross enrollment ratio, primary	—	NA
Gross enrollment ratio, primary (girls)	—	NA
Gross enrollment ratio, secondary	—	NA
Gross enrollment ratio, secondary (girls)	—	NA
Number of primary schools	2007	58
Number of secondary schools	2007	~17

Sources: World Factbook, MOEY

Relevant Policies

Policy	Status	Date	Key points
No policy under consideration	—	—	—

Source: MOEY

preparation for the CXC IT examinations. Computers have been introduced in primary schools through the combined efforts of government and local NGOs, parents groups, and other organizations. An ICT policy in education has not yet been developed; a national ICT policy is in process.

The Government of Antigua and Barbuda funds all education efforts without donor assistance. Education funding comprises roughly 11 percent of the national budget.

Policy and planning

Efforts within the MOE to develop an ICT policy for education have not resulted in policy adoption.

Computers in primary and secondary schools

Schools in Antigua and Barbuda are divided roughly equally between government schools and private schools. Government schools have generally benefited from support for student access to ICT, with

most of their emphasis placed on exam preparation for secondary students. In the absence of ICT policy, these efforts have not led to integration of technology into learning outside of the IT curriculum, nor to routine use of ICT among teachers.

Private schools offer a more varied picture, both in terms of student access and the availability of faculty with computer skills.

ICT in primary schools

The government has launched a pilot program supporting the establishment of small (3–4 computer) labs in six primary schools. The goals of this program, at present, are to test issues surrounding implementation of ICT in schools and to familiarize students with the use of computers. Computers in this program feature office-productivity software and are connected to the Internet via ADSL provided by Antigua Public Utilities. Use of the computers by students and teachers is largely ad hoc. Some members of the faculty at these schools do have adequate computer skills as a result of prior professional-development initiatives, including several introduced by OERU and current certificate programs offered to the general public by TLLs.

Future goals include expansion of the number of schools with computer labs and support for use of the labs by adults in surrounding communities. As a result of effective political representation, schools in two communities have received computer labs and support for community-focused programs of this type.

Private schools, and some public schools, have received computers as donations from their local PTAs or other organizations.

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools, government	32	~200	<ul style="list-style-type: none"> ■ ~6 pilot schools with 3–4 computers; no ICT program in place ■ Other schools may have small numbers of computers as the result of donations, community efforts, etc. ■ Each school has 1–2 computers for administrative purposes
Primary schools, private	26	—	<ul style="list-style-type: none"> ■ Many schools have computers as a result of donations, community efforts, etc.
Secondary schools, government	9	—	<ul style="list-style-type: none"> ■ 1 lab per school ■ Focus on CXC IT curriculum

Source: MOEY

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
Antigua and Barbuda International Institute of Technology (ABIIT)	Government workers, including teachers	Provide access to training in various areas of ICT	Scholarships available for all government workers	<ul style="list-style-type: none"> ■ No specific programs for teachers ■ General continuing education courses don't address goals or requirements of successful ICT use in schools

Source: MOEY

ICT in secondary schools

All of the country's nine public and eight private secondary schools have computers labs. These labs are used almost exclusively to enable 3rd and 4th form students to prepare for the CXC IT examinations. High demand for these preparatory classes and limited capacity creates pressure on scheduling, but most or all students who desire to are able to complete the IT elective. Students in lower classes typically do not have access to the computers.

No effort has yet been made to integrate ICT into teaching and learning in other areas of the curriculum. Discussion within MOE has identified integration as a desirable outcome, but no programs have yet been established to support increased access. Future goals include expanding student access to computers, enabling younger students to familiarize themselves with ICT and increasing use of computer tools for learning and productivity.

Teacher professional development

Teachers in Antiguan primary schools typically attend a two-year A.A. program at the Teacher Training College, operated in collaboration with University of the West Indies. Secondary teachers complete this same program, and then participate in continuing-education programs via the UWI Distance Education Center (UWIDEC) or other means. These programs do not currently address ICT.

There are currently no formal in-service TPD programs in Antigua and Barbuda. However many private and community-based organizations offer training in a range of ICT skills.

The foremost of these organizations is the Antigua and Barbuda International Institute of Technology (ABIIT), which was founded in 2001 to help Antiguan compete in the global economy by enabling them to earn associate degrees and certificates in disciplines such as accounting, banking and finance, and graphic design, as well as ICT-focused areas such as programming, network management, and Web design. Launched at a cost of US\$6.2 million, ABIIT includes a large computer lab, plus multimedia equipment and 20 computer workstations in each classroom. OERU has designated ABIIT as its Center for Specialization in Information Technology. ABIIT can accommodate a maximum enrollment of 1,440 students.

As government workers, teachers in Antigua and Barbuda receive scholarships offsetting tuition fees to encourage them to attend courses at ABIIT. In addition, the training division of MOE has in conjunction with ABIIT offered TPD in basic computing at various times.

Tertiary education and TVET

Tertiary institutions in Antigua and Barbuda include ABIIT, the Antigua State College, and the Antigua and Barbuda Hospitality Training Institute (ABHTI). The State College operates as a UWI School of Continuing Studies, offering two-year degrees that can include courses such as microcomputer applications for business use, and computer programming. ABHTI also includes an ICT center to support student learning.

EMIS and integration of technology by MOEY

Antigua and Barbuda has launched an EMIS pilot project, using the AbusSTAR system developed in Barbados. The three-school pilot includes TPD to help teachers master use of the software for data entry.

Antigua previously implemented the Excel-based Performance Management Tool (PMT) developed by OERU, also on a pilot basis. Although the PMT was not adopted on a systemwide basis, several schools involved in the pilot test continue to use the PMT templates to record and present data. The PMT pilot test highlighted the need for effective initial and ongoing TPD in relation to:

- Basic computer use to include use of Excel software
- Data-collection and entry processes and tools
- The importance of education information systems

In this way and in others, the PMT pilot test informs the current test of AbusSTAR. For additional information about EMIS in Antigua and Barbuda, please refer to the section, “Regional and national EMIS initiatives.”

Nonformal education

As mentioned, primary schools will receive support from the government to make computer labs available to the community at large to enable community members to gain ICT skills.

Barriers and challenges

In the absence of goals and objectives outlined in policy statements or planning documents, assessing barriers and challenges to ICT use in education is an artificial exercise. Programs underway in the primary schools are modest. In secondary schools, access to ICT appears to adequately enable students to prepare for CXC IT exams, although demand apparently has reached the limits of capacity. The education system, as a whole, places only limited emphasis on the use of computers and the Internet.

Efforts to increase emphasis on ICT use would require attention to TPD and curriculum in relation to ICT, and would likely encounter limitations in terms of human capacity, infrastructure, and maintenance. However, without more specific goals or objectives, assessment of the impact of these limitations is moot. (Maintenance has, however, already been listed as a challenge by Antiguan respondents.)

The EMIS pilot project is significant—especially in light of difficulties in information management in education encountered throughout the region. With prior ministry-level experience of EMIS implementation, the current effort in Antigua offers a well-structured test of the suitability of the locally developed AbusSTAR technology outside of its country of origin, Barbados.

Summary

Systemwide use of ICT in schools in Aruba has not progressed at a rate commensurate with the country's economic success. Chief barriers are the absence of ICT policy or ICT prioritization in education, a concomitant lack of funds, and teachers' inadequate mastery of ICT skills.

However, the Aruba Pedagogical Institute (IPA), trains all primary teachers and houses the School of Tomorrow project. School of Tomorrow supports two ICT pilot schools as well as a technology-rich model classroom that facilitates experimentation with ICT integration, teaching to multiple intelligences, and development of collaborative and project-based learning activities.

Aruba was awarded independence from the Netherlands Antilles in 1986, and remains a

separate, autonomous member of the Kingdom of the Netherlands. Tourism has been the main economic driver over the last five decades, followed



Basic Data

Category	Date	Value
Population	2006	71,891
Per capita GDP (PPP)	2004	\$21,800
Economy, composition	2006	Tourism, oil production and refining
Literacy, total population 15 and over	2006	97
Literacy rate (women)	—	NA
Gross enrollment ratio, primary	2002/3	115.1
Gross enrollment ratio, primary (girls)	2002/3	111.6
Gross enrollment ratio, secondary	2002/3	103.1
Gross enrollment ratio, secondary (girls)	2002/3	106.7
Number of early education, or "kindergarten," schools (students 4–6 years old)	2006	25
Number of basic education schools (students 6–12 years old)	2006	34
Number of secondary schools	2006	13
Language of instruction	—	Dutch

Sources: World Factbook, UNESCO, Min. of Education and Labor

Relevant Policies

Policy	Status	Date	Key points and objectives
No ICT-related policy	—	—	—

Source: MOEL

by oil refining. Hotel occupancy rates substantially above the regional average afford Arubans one of the higher standards of living in the Caribbean.

Policy and planning

The current education policy in Aruba was adopted in 1988. This document does not include consideration of ICT-related issues. Development of a policy addressing ICT in education is included as an objective in Aruba's education plan for 2007–2017.

The absence of ICT policy in education notwithstanding, the DOE is in the process of a 10-year curriculum reform project. The primary goal of reform is to re-design the education system overall, introducing greater innovation and integrating different courses. The introduction of Papiamentu, the native language of Aruba, into the lower-primary curriculum is considered essential for development of the children. A secondary goal of the process

involves developing an integrated curriculum that includes integrated use of ICT.

ICT in primary and secondary schools

Over the course of the past 15 years, most ICT initiatives in schools in Aruba have been initiated by organizations outside the DOE (e.g., NGOs, private sector organizations). However, government-sponsored renovation of 13 secondary schools between 1995 and 2000 included establishment of one computer lab in each school with a WAN linking these schools to the Internet through a central server.

Secondary schools in Aruba are augmented by technical and vocational schools offering training and education in subjects such as hotel management, construction, and healthcare. Technical/vocational schools offer students access to computers with ADSL-based Internet connections.

Primary schools

Of the 25 kindergarten schools (ages 4–6), three schools have computer labs, with another 11 schools having one to two computers in classrooms.

Of the 34 basic-education schools (ages 6–12), 20 schools have computer labs. These schools do not typically have computers in classrooms. However, an additional seven basic-education schools have

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Kindergarten schools	25	Unknown	<ul style="list-style-type: none"> ■ 3 schools have computer labs ■ 11 schools have 1–2 computers in classrooms (as of January 2005)
Basic education schools	34	~250	<ul style="list-style-type: none"> ■ 20 schools have computer labs ■ 15 desktop computers per lab ■ 7 schools have mobile labs (~15 laptops) ■ Educational software (Dutch, math, science)
Secondary schools (includes vocational/technical)	13	Not known	<ul style="list-style-type: none"> ■ >30% of schools have computers and are connected to the Internet ■ Primary uses are acquainting students with ICT, preparing for ICT exams and building students' abilities to use ICT for different vocational applications ■ Schools with computers have educational software (Dutch)

Source: MOEL

mobile carts, with approximately 15 laptops per cart, enabling computer use in classrooms. Students have access to educational software reinforcing learning in Dutch language arts, math, and science.

Computer-lab installations typically include: one computer lab with 15 desktops or laptops, a minimum of one color printer, one scanner, one digital video camera, 3 digital photo cameras, 15 audio headphones, and 15 webcams.

The Pedagogical Institute of Aruba (IPA) School of Tomorrow initiative has designated two basic-education schools as pilot sites for the integration of ICT into the curriculum through project-based learning. These schools make use of curricula that include ICT, and that have resulted from Aruba's curriculum-reform process, while testing pedagogical strategies that support active learning and learner-centered activities.

The DOE currently plans to complete preparation of primary schools to receive ICT in the 2008–2009 academic year.

Secondary schools

Over 33 percent of secondary schools have computers and Internet connections (via systemwide WAN). Students primarily use these computers to build ICT skills and to prepare for ICT exams. IT curricula include use Microsoft Office productivity tools. Educational software is also available to reinforce learning in math, language arts, and science. Students use SuperLogo as a platform to build programming skills.

Teacher professional development

Teacher education in Aruba begins during secondary education: prospective primary teachers enter a five-year program (general education); after graduation, this program is followed by four years' study at the Aruba Pedagogical Institute (IPA). The ICT curriculum consists of two modules—Basic ICT skills and ICT in education—that are taken by all pre-service teachers.

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
DOE ICT in-service training	In-service primary and secondary teachers	Familiarize teachers with ICT and curriculum integration Enable trained teachers to serve as champions or "multipliers"	■ 29 teachers trained in 2004	■ Second phase, in which teachers receive TPD on championing ICT in schools, has not taken place ■ Teachers' limited access to ICT in schools ■ Program is not coordinated with new ICT-appropriate curriculum
UNESCO ICT liaison training	In-service teachers in primary and secondary schools	Empower teachers to serve as points-of-contact for system-wide assessment of ICT in schools	■ 34 teachers in one workshop	■ Primary teachers are transferred among schools each year ■ Abilities vary widely among teachers
Aruba Pedagogical Institute (IPA)	Pre-service primary teachers	Familiarize teachers with ICT Build foundational understanding of ICT integration	■ All candidates preparing to teach in primary school ■ Enrollment is less than 100 students ■ Two course modules (with additional support by on-site School of Tomorrow)	■ Limited access to ICT in primary schools does not support ICT integration effectively
School of Tomorrow at IPA	Pre-service and in-service teachers; students	Investigate practice of integrating ICT in the Aruban curriculum Develop resources and support ICT projects for schools	■ Select teachers and researchers	■ Funding for ICT in Aruba has yet to enable results and/or practices to be disseminated widely ■ Majority of faculty in Aruban schools lacks essential ICT skills

Source: MOEL

Secondary teachers are educated outside Aruba, typically at universities in the Netherlands. A small number are educated in Aruba in response to school staffing needs.

The IPA School of Tomorrow team (www.schooloftomorrowipaaruba.com) coordinates pre-service ICT studies. The School of Tomorrow team also supports the two pilot schools participating in the School of Tomorrow project and operates a School of Tomorrow lab at IPA. The lab serves as a model classroom, modeling the affordances of a technology-rich learning environment, facilitating experimentation with ICT by both pre-service and in-service teachers, and supporting the use of ICT in Aruban schools.

In part because the School of Tomorrow is relatively new, the majority of teachers currently in service in Aruba lack ICT skills required to benefit from or support School of Tomorrow activities.

The School of Tomorrow has also developed (or participated in the development of) Web-based resources. These include a site cataloguing Aruban flora and fauna and a general-reference site, which covers subjects such as topography, political structure, and the economy. The School of Tomorrow has also managed collaborative projects among students at the Colegio Cristo Rey, one of the Classroom of Tomorrow pilot schools, and among IPA teacher-candidates.

As part of these projects, participants were supported in the creation of blogs. Although both student and teacher blogs remain available on the Web (www.schooloftomorrowipaaruba.com/wc2006/cave/blogs.htm), in almost all cases activity consists of a few posts and comments on and around the dates that the blogs were launched.

A separate Cascade-method TPD initiative was launched in 2004 to train teachers from each primary school to become ICT leaders who would be responsible for training other teachers in their schools. Although the first phase of training was completed, the second phase, which comprised train-the-trainer sessions, was not held as a result of lack of funding and other factors.

Tertiary education

In addition to IPA, tertiary education is provided by the University of Aruba (UA), which offers pro-

grams in law, finance and economics. Enrollment is approximately 200 students.

UA affords students access to computers with ADSL Internet connection.

Non-formal, distance, and open education

Non-formal, distance, and open modes of education are not currently factors in Aruban education at this time.

EMIS

As of early 2007, the DOE is not engaged in EMIS implementation. Among the barriers to effective EMIS is a countrywide lack of technical expertise. Compounding this situation is lack of funding for EMIS within the DOE.

Barriers and challenges

- **Lack of guidance from policy may influence priorities.** Aruba is one of very few Caribbean countries that does not have an ICT policy for education adopted or in draft form, or in process. Development of ICT policy is included in the National Education Plan for 2007–2017. Other barriers cited in this section may stem from or be reinforced by the absence of policy. Specifically, as Aruba is among the wealthier countries in the region and has historically allocated a relatively high portion of government spending to education, problems arising from inadequate funding are very likely made more challenging.
- **Inadequate funding affects ICT access and human resources.** Although several ICT-focused TPD initiatives have taken place across the entire primary-school system, impact has been minimal because teachers and their classes do not have adequate access to computers and the Internet. Similarly, lack of technical capacity within the DOE and local consultants—cited as contributing factor in the lack of EMIS—has been attributed partially to inadequate wage scale for ICT-related jobs.
- **Teachers' ICT skills are inadequate.** Efforts are made at IPA and the School of Tomorrow to support integration of ICT across the primary curriculum. Ineffective TPD, however, combines with lack of access and incentive to minimize use of ICT to support broad-based learning in schools.

Barbados

Summary

Over the last decade, Barbados has launched an ambitious program of education reform, EduTech 2000, which features a strong ICT component. The US\$213 million EduTech project has experienced significant delays in its civil works component, with those delays reflected in delays in ICT implementation. In contrast, major EduTech activities—reforming the primary and secondary curricula and providing ICT-focused TPD—have been implemented to some extent, and have introduced increased use of learner-centered pedagogies. As of 2007, EduTech ICT planning has been revised and the project is moving forward with installation of classroom- and lab-based computers.

The four Barbadian tertiary institutions offer a range of ICT-related certificates, diplomas, and degrees. Several also offer courses via e-learning.

The standard of living in Barbados is among the highest in the region. However, key sectors such as tourism and product assembly are strongly influenced by the global economy.



Basic Data

Category	Date	Value
Population	2006	279,912
Per capita GDP (PPP)	2005	\$17,300
Economy, composition	2006	Tourism, sugar, light manufacturing, component assembly for export
Literacy, total population 15 and over	2002	99.7
Literacy rate (women)	2002	99.7
Gross enrollment ratio, primary	2002/3	104.3
Gross enrollment ratio, primary (girls)	2002/3	103.8
Gross enrollment ratio, secondary	2002/3	89.8
Gross enrollment ratio, secondary (girls)	2002/3	89.7
Number of primary schools*	2006	82
Number of secondary schools	2006	23
Language of instruction	—	English

* Figures are for government schools only. At both the primary and secondary levels in Barbados, there are less than 10 private schools.

Sources: World Factbook, UNESCO, MOEYC

Relevant Policies

Document	Status	Date	Key points and objectives
White paper on education reform: Preparing for the twenty-first century	Adopted	1995	<ul style="list-style-type: none"> ■ Revalue the role of education in national development ■ Develop a workforce that adapts to changing conditions ■ Develop creativity ■ Revalue the role of teachers
EduTech 2000 Master Plan	Adopted	1997	<ul style="list-style-type: none"> ■ Purpose behind use of ICT ■ Structures required to support integration of ICT into curriculum
Curriculum Reform 2000	Adopted	2000	<ul style="list-style-type: none"> ■ Places student at center of the teaching and learning processes ■ Emphasized technology integration

Source: MOEYC

Historically, Barbados allocates a high share of GDP to education (7.9 percent in 2001). This level of expenditure has led to significant achievements, including universal enrollment in primary and secondary education, free primary and secondary education, and support for some costs of textbooks, transportation, and meals.

The government's 1995 white paper on education targeted development of a twenty-first century workforce, and led to the Education Sector Enhancement Program, launched in 2000, strongly focused on curriculum change supported by the integration of ICT into both primary and secondary instruction.

Policy and planning

The 1995 White Paper anticipates the need for a flexible, technologically skilled workforce. From this

goal, the White Paper derives a series of objectives that together outline a transformation of Barbadian education from an industrial-age system to a system that acknowledges the individual needs and capacities of learners, that nurtures creativity and problem solving, and that lays a foundation for lifelong learning.

The White Paper, the EduTech 2000 Master Plan, and the Curriculum 2000 document have together been used as a touchstone to guide policy, planning, and implementation of the Education Sector Enhancement Program—also known as EduTech 2000. The Master Plan, which was included in proposals to project funders, outlined structures required by integration of ICT into all aspects of teaching and learning, including human and technological resources, school-level planning, and an articulated vision of the uses of ICT in schools.

ICT Resources in Schools

School type	Number*	Median enrollment	ICT profile
Primary schools	82	332	<ul style="list-style-type: none"> ■ About 30% of primary schools have received computers from the government ■ These schools are connected to the Internet
Secondary schools, government	23	888	<ul style="list-style-type: none"> ■ All secondary schools have at least one computer lab (~30 computers) and an Internet connection ■ ADSL broadband connectivity is provided to all schools

* School totals include both government schools and private schools that receive government assistance ("government-assisted schools"). There are 71 government primary schools and 11 private assisted primary schools; there are 23 government secondary schools and 6 private secondary schools.

Source: MOEYC

EduTech 2000: Primary and secondary educational reform with ICT support

With an overall budget of US\$213 million, EduTech 2000 represents substantial commitment on the part of the Government of Barbados and the Ministry of Education, Youth Affairs, and Culture (MOE Barbados) to broad reform of teaching and learning in support of the White Paper. Fifty-five percent of the EduTech budget is comprised of CDB (40 percent) and IDB (15 percent) loans, with the remainder provided by the Government of Barbados.

The technology-infrastructure component of EduTech is budgeted at US\$88 million.

EduTech design: Focus on curriculum

The project was initially conceived as having four components:

- Civil works (or school facilities improvement)
- Curriculum development and reform
- Teacher professional development
- ICT infrastructure

In line with the objectives outlined in the 1995 White Paper, EduTech 2000 is most strongly focused on enhanced teaching and learning through re-design of the Barbadian curriculum at all primary and secondary levels. The use of ICT has been designed primarily to support teaching and learning activities in relation to new curricula.

The curriculum development component, or Curriculum Reform 2000, “places the student at the centre of the learning process and emphasizes the integration of various technologies across the curriculum.”¹ In primary grades, students are intended to learn organization, self-management, problem solving, conflict resolution, and other social and emotional “skills.” Although Barbadian students participate in the CXC exams, the learner-centered curriculum is also intended to be supported by various authentic assessment techniques at all levels. MOE Barbados education officers working with teams of in-service teachers and UWI education faculty facilitated the curriculum development. Draft curricula were reviewed by a Curriculum Development Council and were field tested in schools before being finalized and adopted.

The EduTech 2000 project experienced substantial delay centering on unexpected challenges in the project’s civil works component. Completion of civil works plans at present entails facilities improvements to 6 schools by the end of 2006, 8 schools in 2007, and 14 schools in 2008.

Although curriculum reform and teacher development proceeded on schedule, delays in facilities improvements resulted in delays in implementing the ICT infrastructure component. The technology-rich installations called for in EduTech could not be accommodated in many Barbadian schools without completion of the planned facilities upgrades.

In 2005, MOE Barbados re-designed the EduTech program to target the provision of ICT to all secondary schools as quickly as possible. Initial installations, in this new model, would be much less extensive than those originally planned. These installations are intended to support learning and skills acquisition by students and teachers, lesson preparation, and school administration.

For more information about the challenges encountered by EduTech 2000 and program responses to those challenges, refer to the *Project Profile: EduTech 2000, Barbados*.

ICT in primary schools

At present, 24 primary schools have received their full complements of computers from the government, enabling them to establish labs and place computers in classrooms. Schools have from 12 to 30 computers for instructional use. In some instances, MOE Barbados computers provided through EduTech will supplement computers that they have received previously as donations (possibly new or refurbished) from their local communities.

Many primary schools have distributed existing computers to classrooms for use by teachers and students, often choosing to create several one-computer classrooms rather than a fully outfitted lab. This choice may be influenced in primary schools by lack of space, as well as by educational considerations.

¹ MOE. 2001. *National report on the development of education in Barbados*.

In addition to productivity software, primary schools offer students educational software, including titles such as Thinkin' Things, Story Reader, and Crocodile Clips science simulations.

Each primary school has one IT coordinator on staff. Teachers, administrative staff, and school leadership also have access to computers, with a current target of three to four computers per school for administrative and teacher use.

ICT in secondary schools

At present, all 23 Barbadian government secondary schools and all 6 schools that receive government assistance have at least 30-computer lab installations. All of these schools also have Internet connectivity, but in some schools, only a sub-set of computers is connected to the Internet. Of these schools, 11 have received their full complement of lab hardware, software, and peripherals; a tender to meet the needs of the other schools is in process. Of the 11 schools, five have taken delivery of new laptops and carts to enable use of ICT in classrooms.² The remaining 6 of these schools will receive mobile-computing equipment in Phase 2 of the current installation process.

C & W provides connectivity to Barbadian schools, with discounted costs paid by MOE Barbados.³ As installation progresses, all schools will shift to “business-level” ADSL connections.

Under the re-designed EduTech component, secondary schools will, like primary schools, provide teachers and students with laptops on demand (1 laptop per 10 students) using mobile carts and wireless networking. Each school will also have three to four computer labs. Labs will range from 15 to 30 computers, and will typically be dedicated for use by specific departments (e.g., IT, math/science, language and literature, etc.) and will feature educational software addressing the core curriculum as well as other areas, such as health, family, and critical thinking. The number of computer labs in a given school will depend on school enrollment.

Although planned installations are large, secondary schools have only one IT coordinator on staff to support intensive integration of ICT across the curriculum. The IT coordinator is the primary support for lab and laptop timetabling and for ICT integration. However, department heads may receive additional training, intended to enable them to

provide additional support for teachers in their departments and to spark collaboration among teachers in different schools.

Teacher professional development

One of Barbados' four tertiary education institutions, Erdiston Teachers College is the sole government provider of TPD to pre-service teachers. The reformed curriculum was introduced while still in draft form in 2000, and is fully supported at Erdiston. The two-year pre-service curriculum includes basic computer skills.

In-service teachers may also take part-time professional development courses addressing topics that include leadership, authentic assessment, and other topics as well as ICT.

The central TPD initiative under EduTech, however, has been outsourced to a private sector ICT company, Illuminat (Barbados). Since 2003, Illuminat has staged two-week summer ICT intensives for in-service primary and secondary teachers, partially supported by Microsoft Corporation (BDS\$100,000). Goals for basic ICT training included delivery to 90 percent, or 2,700, of Barbados' 3,000 teachers. Most recent reports suggest that at most 65 percent of primary teachers and 76 percent of secondary teachers have participated in this program, while participation in TPD addressing teaching methodologies is much lower. Teachers do not receive credit for participation in summer TPD programs, which may contribute to lower-than-expected participation.

MOE Barbados personnel report that teachers—particularly secondary teachers—are embracing ICT as a teaching tool, however project evaluations suggest that use of technology is limited in relation to the high cost of the EduTech project.

Challenges in relation to TPD include the brevity and lack of depth of in-service programs. The

² In several schools, mobile, cart-based laptops were used previously as part of the NetSchools project. See “Project profile: EduTech 2000, Barbados,” for more information.

³ As of January 2007, C & W Barbados has announced that it will upgrade Internet connections in both primary and secondary schools.

Teacher Professional Development Programs

TPD organization	Target population	Objectives	Scale	Barriers
Erdiston Teachers College	Pre-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Train prospective teachers in: ■ Learner-centered curriculum ■ Use of ICT ■ Integration of ICT and curriculum 	<ul style="list-style-type: none"> ■ ~100 primary teachers per year ■ ~30 secondary teachers per year 	—
Erdiston Teachers College	In-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Train prospective teachers in: ■ Learner-centered curriculum ■ Use of ICT ■ Integration of ICT and curriculum 	<ul style="list-style-type: none"> ■ Roughly 30 teachers per semester as part-time students 	<ul style="list-style-type: none"> ■ Current need is to develop more advanced (follow-on) training ■ Scheduling training to coincide with teachers' access to ICT in schools
Illuminat	In-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Technology mastery ■ Teaching methodology (learner-centered) 	<ul style="list-style-type: none"> ■ 300 teachers every summer, in two-week sessions ■ Not currently accredited (accreditation is planned) 	<ul style="list-style-type: none"> ■ Summer intensive strains teacher commitment ■ Two-week format is too brief ■ Capacity of company to support more advanced pedagogies and ICT innovation

Sources: MOEYC, The Natoma Group

two-week summer format for TPD is short and it is removed from the classroom; teachers currently do not receive credit for participating. TPD needs to be re-structured to help teachers increase their mastery of teaching with technology, and to support innovation among both teachers and students.

EMIS and ICT capacity among MOE Barbados administration

Given the scope, scale, and timeframe of the EduTech project, IDB and other donors have established stringent benchmarks for reporting of project indicators. In conjunction with these benchmarks, IDB has funded development and required use of an EMIS database—a requirement that is becoming standard for IDB projects. MOE Barbados expanded the design of the database to enable all entities in Barbadian education, including tertiary-level institutions (TLIs) to upload data. Substantial components of data collection and analysis are now automated, with enhanced query and reporting features. In 2007, Barbados is also pilot testing school-level EMIS software developed by the Barbadian company AbusTechnologies. For additional information, refer to the section “Regional overview of EMIS.”

Tertiary Education

There are three national tertiary and post-secondary institutions in Barbados, in addition to the Cave Hill campus of the regional UWI.

Of these three, the Barbados Community College offers the broadest array of ICT-related programs. The Division of Computer Studies awards B.Ed. degrees in technical/vocational education to current teachers, associate degrees in IT to undergraduates, and certificates encompassing technical topics such as visual basic and Web design. The division is also responsible for maintaining the IT systems of Barbados Community College.

The Samuel Jackman Prescod Polytechnic ([SJPP]—named after a 19th century hero in the struggle for black rights in Barbados) offers full- and part-time courses in CAD, computer and electronics maintenance, office technology, IT, network administration, office technology, Web design. Students have free Internet access in the campus library.

Demand for post-secondary and tertiary education in Barbados far exceeds capacity. To address this, SJPP offers several courses via asynchronous, instructor-led e-learning, including elder care, child care, and occupational health and safety, among other subjects.

ICT in Tertiary Education

Institution	Target population	Objectives/degrees	ICT
UWI, Cave Hill Campus Dept of Computer Science, Mathematics and Physics	Undergraduate students	<ul style="list-style-type: none"> ■ B.Sc. Computer Science (optional emphasis on accounting or management) ■ Certificate, Information Technology 	<ul style="list-style-type: none"> ■ The department makes course information available via the Web ■ UWI offers some course materials via Web CT
UWI, Cave Hill Campus Dept. of Computer Science, Mathematics and Physics	Graduate students	<ul style="list-style-type: none"> ■ M.Sc., M.Phil., Ph.D. Computer Science 	<ul style="list-style-type: none"> ■ The department makes course information available via the Web ■ UWI offers some course materials via Web CT / Moodle
Barbados Community College	Teachers (holding Erdiston Teachers Certificate)	<ul style="list-style-type: none"> ■ B.Ed, Technical/Vocational Education ■ Diploma, Technical/Vocational Education (post-graduate) 	—
Barbados Community College	Undergraduates, post-secondary students	<ul style="list-style-type: none"> ■ Associate Arts/Science, Information Technology ■ Associate, Applied Science (Computer Science) ■ Certificate, Information Technology 	—
Samuel Jackman Prescod Polytechnic	Post-secondary students	<ul style="list-style-type: none"> ■ Associate Arts, Electrical Engineering 	—
Erdiston Teachers College	Pre-service and in-service teachers	<ul style="list-style-type: none"> ■ Teachers Advanced Professional Cert. ■ Teachers Advanced Prof. Certificate, Technical/Vocational education ■ Diploma Ed. ■ Additional certs. 	—

Sources: UWI, The Natoma Group

University of the West Indies, Cave Hill

UWI has main campuses in Barbados, Jamaica, and Trinidad, plus 12 additional centers. The UWI Cave Hill campus in Barbados houses a Department of Computer Science, Mathematics, and Physics.

Barriers and challenges

Barriers, challenges, and lessons learned in relation to EduTech 2000 are addressed in the section, “Project Profile: EduTech 2000, Barbados.”

British Virgin Islands

Summary

Within the past two years, the MOE and the DOE of the British Virgin Islands have made much headway in resolving maintenance issues, greatly increasing access to and use of ICT in the public primary and secondary schools of the British Virgin Islands. Teachers typically gain ICT skills during college and university education. A government-wide WAN completed in late 2005 has greatly improved Internet access in schools and re-opened the possibility of effective EMIS.

Planned activities include increasing teachers' access to ICT for administrative and instructional activities, as well as plans reorganizing school-based computing to support greater integration of ICT across the curriculum. However, these plans require additional procurement, development of new curricula, and significant in-service TPD and are progressing slowly.



The economy of the British Virgin Islands is among the strongest in the Caribbean, although it shares the nearly region-wide dependence on tourism as its largest sector. Beginning in the 1980s, the

Basic Data

Category	Date	Value
Population	2006	23,098
Per capita GDP (PPP)	2004	\$38,500
Economy, composition	2006	Tourism, corporate financial services, livestock
Literacy, total population 15 and over	1991	97.8
Literacy rate (women)	—	NA
Gross enrollment ratio, primary	2002/3	106.6
Gross enrollment ratio, primary (girls)	2002/3	103.3
Gross enrollment ratio, secondary	2002/3	98.8
Gross enrollment ratio, secondary (girls)	2002/3	94.1
Number of primary schools	2006	16
Number of secondary schools	2006	4*
Language of instruction	—	English

* Of the four secondary schools, two are secondary-only, while two are all-age schools including secondary-school components.

Sources: World Factbook, UNESCO, MOE

Government of the British Virgin Islands has offered offshore corporate registration, thereby increasing revenues in ways that are less influenced by outside economic cycles.

The situation regarding ICT in schools reflects both the recent history of economic success and many of the challenges that have proven intransigent throughout the Caribbean region and the world. All schools have computers and Internet connectivity, and the teaching staff generally possesses ICT skills. Integration of ICT across the curriculum, on the other hand, has yet to take place. Systemwide implementations such as EMIS are in process, but are not aggressively progressive.

document current and to better prepare it for adoption. As of late 2006, however, the ministry has not completed the adoption process.

Objectives in the draft policy focus specifically on areas in which the education system can improve its performance in relation to the use of ICT. Notably, these areas include enhancing teaching and learning, continuous TPD, and increased efficiency system wide. Although the influence of policy on implementation is not always direct, timely adoption of the policy has the potential to focus additional financial and human resources on these areas.

Development of a national ICT policy may also be in process.

Policy and planning

In the critical—and frequently challenging—area of maintenance, the MOE has made significant progress within the last two years as a result of strong advocacy and collaboration between the ministries and departments.

The draft ICT policy document was originally a direct outcome of the 2002–2003 policy initiative by OERU. British Virgin Islands personnel worked closely with OERU personnel and consultants during the drafting process to elaborate on and adapt the policy OERU policy template. More recent iterations, including the last version completed in 2005, have been made to keep the

ICT in schools

Programs in ICT in education in the British Virgin Islands began in the later 1980s (with CXC ICT exam preparation) and were followed by computer-literacy initiatives for teachers in the early 1990s. Between 1997 and 1999, the DOE's IT program was reorganized and expanded, chiefly by the establishment of school computer labs.

Despite its relatively long history of effort, recent improvements in services to both primary and secondary schools have led to significant increases in the value returned by the MOE's investment in ICT.

Relevant Policies

Document	Status	Date	Key points and objectives
Draft policy document	Draft	2005 (Most recent version)	<ul style="list-style-type: none"> ■ Promote harmonization of activities, approaches, and standards in the use of ICT ■ Encourage meaningful use of ICT by administrators, teachers, and students to enhance teaching and learning ■ Ensure that school-leavers have required skills for employment and further study ■ Foster the concept of lifelong learning ■ Provide continuous professional development to teachers ■ Facilitate efficiency within the ministry and DOE ■ Support ICT use among special-needs populations

Source: MOE

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Public primary schools	16	—	<ul style="list-style-type: none"> ■ 1 lab per school ■ 10 computers per lab ■ ADSL Internet connection
Public secondary schools	4	—	<ul style="list-style-type: none"> ■ Main HS has 6 labs of 30 computers, plus one lab for technical education ■ 2nd all-secondary HS has one lab of 30 computers, used for basic ICT plus technical/vocational learning ■ ADSL Internet connection

Source: MOE

Current ICT programs in primary and secondary schools are funded as recurring costs in the MOE annual budget. In some instances such as facilities improvement, initiatives are funded as a capital project. Schools have also benefited from at least a few significant donations from private sector companies.

Island-wide WAN connectivity

Since late 2005, all school computer installations are connected via DSL-based WAN to the government's central server and from that server to the Internet. Bandwidth is adequate at this time, although high-bandwidth uses such as videoconferencing are now being introduced.

Before the present WAN, the system that was in operation was based on dialup connections provided by C & W. This arrangement was free to schools but there were many issues preventing maximum operational performance.

Hardware and network maintenance

MOE efforts in computer and network maintenance in both primary and secondary schools have radically improved performance in an area that was previously problematic. Maintenance is the responsibility of the IT Service Unit, which services all government-owned computers, a situation that had since the 1990s—when computers were first introduced to schools in the British Virgin Islands—led to very low levels of service and responsiveness. Problems backlogged because of staffing and other issues at the IT Service Unit and at the DOE. Through 2005, the percentage of functioning computers in schools was very low. This problem was much worse in primary schools, which lack accredited IT teachers on staff.

(The situation in primary schools was also affected by staff turnover, in which designated IT liaison persons were transferred to other schools and not replaced.)

In 2006, the MOE and the DOE launched a concerted and ongoing effort to increase communication with the IT Unit and enlist the Unit's support for maintenance in schools. As a result, the IT Unit allocated additional personnel to on-site routine maintenance and repairs in schools. Education personnel continue to meet with the IT Unit staff regularly.

Overcoming the challenge of technology maintenance—especially without an increase in costs—has transformed the ICT in education effort in the British Virgin Islands. Prior to outreach to the IT Unit, lack of functional computers formed a barrier to achievement in all areas; following the improvement in service, the government's investment in hardware, connectivity, and TPD has a new opportunity to return results.

Primary schools

All 16 public primary school have computer labs with approximately 10 computers, all connected to the Internet. The DOE has developed a primary syllabus specifying standards and learning outcomes in relation to ICT that focuses on computer literacy. This syllabus is being renewed in the course of the conduct of the National Curriculum Reform Project, now on the way.

In schools, the computers are used by students at all levels to build ICT skills and to review content in math, language arts, and science as part of prepara-

tion for exams. Upper-primary students also use the computers to prepare reports and other project-related outputs.

Teachers in some schools use computers in their classrooms to make presentations and for administrative purposes. Some of these computers are placed in the classrooms as a part of the development plan for the use of IT in schools, while some are borrowed from the labs.

Because dedicated lab facilities are not available in some schools, computers are installed in those schools in multi-use areas such as resource centers. This difference does not typically lead to different patterns of use.

The major contribution of the private sector to ICT in education was comprised by donation of laptop computers by a local hotelier to establish a computer lab in one primary school. That donation was followed by four years of support for an in-school IT specialist providing assistance and technical support to teachers and students. With additional hardware, access, and support, students in the school have been more involved in online collaborative projects, engaging in postage-stamp exchanges with students in other countries and in the UNESCO ASPnet beach-monitoring project, Sandwatch.

Other private sector contributions include donations of used and new computers to schools by private businesses, basic Internet training for teachers, provided by C & W in 2000, and a TPD workshop delivered by personnel of the Ontario College of Art and Design (OCAD).

Secondary schools

As mentioned, British Virgin Islands has two secondary-only schools complemented by two all-age schools that include secondary-level cohorts. More than two-thirds of British Virgin Islands secondary students are enrolled at the British Virgin Islands High School (BVI HS) on the island of Tortola. There are six labs of 30 computers each in the school, serving an enrollment of approximately 1360 students. The computers are primarily used by students in the senior section of the school who are preparing to leave school for the world of work or preparing for preparing for the CXC ICT exam and for further studies after high school use these.

The other secondary-only school, the Bregado Flax Educational Centre Secondary Division on the island of Virgin Gorda, with a population of some 230 students, has one lab of 30 computers. The lab is used similarly to the lab in BVI HS, except that the school's smaller enrollment allows even students in the lower section of the school to also benefit from computer classes.

In the all-age schools, there is one computer lab per school used by all students in the school.

Teacher professional development

There are no major initiatives in ICT-focused TPD at present though there is an interest in pursuing TPD as it relates to integrating ICT into the curriculum. School faculties are increasingly composed of degree-holders, and ICT has become ubiquitous at the local, regional, and international colleges and universities. As a result, almost all teachers now in service started in British Virgin Islands schools with a foundation of ICT skills.

Two earlier efforts at ICT-related TPD did not achieve success. During the 1990s, when the first computers were installed in primary schools to support teacher learning and use, an in-service TPD program was also implemented. However, limited access to technology (one computer) and out-of-sequence delivery of TPD (prior to the installation of the computers) resulted in little impact. Similarly, in-service TPD intended to support use of an EMIS package foundered in part because both TPD and EMIS were initiated prior to development of the country-wide WAN. As a result, participating teachers were unable to access the system at the time of their training. As a result, their skills and enthusiasm waned.

Tertiary education

The local community college, the HLSCC, has campuses on Tortola and Virgin Gorda. These serve as delivery points for programs from a number of universities in England, the United States, and the Caribbean. HLSCC has an advanced technology infrastructure. Current and even some cutting-edge hardware and software outfit an ample number of computer labs. Many of the classrooms are equipped

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
Local, regional, and international higher-education institutions	Pre-service teaching candidates	<ul style="list-style-type: none"> ■ No specific objectives: Students gain ICT skills in the course of studying for Certificate in Education, B.Ed., B.A., and B.S. degrees 	<ul style="list-style-type: none"> ■ Majority of teachers have university degrees 	—
Periodic in-service TPD by the DOE	In-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Familiarize teachers with specific software titles ■ Train teachers to integrate technology into their regular curricula 	<ul style="list-style-type: none"> ■ May be open to all teachers on a volunteer basis or may be targeted to certain group(s) 	<ul style="list-style-type: none"> ■ Need for teacher release time or to schedule during breaks
EMIS training	In-service teachers at primary and secondary levels	<ul style="list-style-type: none"> ■ Train school personnel ■ School personnel use Lotus Notes as a means of communication between schools and the DOE 	<ul style="list-style-type: none"> ■ School personnel in both primary and secondary schools 	<ul style="list-style-type: none"> ■ EMIS tool has not been functional due to lack of access to centralized components ■ Lack of routine access to ICT for teachers in primary schools
Computer-literacy training no longer emphasized	In-service primary teachers	<ul style="list-style-type: none"> ■ Build familiarity with use of ICT to enhance teaching and teacher productivity 	<ul style="list-style-type: none"> ■ All primary teachers 	<ul style="list-style-type: none"> ■ Usually one computer in each school at the time of training

Source: MOE

with digital whiteboards. There is a videoconferencing center that is also used by the local extension division of the UWI. They are also now in the process of piloting a video conferencing link between the two campuses. There is a predominance of use of technology in instructional purposes at the college. Most information pertinent to the college can be accessed on the college's network, or via the Internet including course information, student's grades, etc.

EMIS and use of technology within the MOE

British Virgin Islands has struggled with EMIS for years. There was some experimentation with the OERU regional EMIS prototype in 2000, even though the procurement of the EMIS package School Administrative Student Information (SASI) had already been made. A Pearson Education product, SASI supports data collection and reporting of student demographics, attendance, grades, schedules, health, and other information. As discussed in the previous section, launch of SASI before implementation of the government WAN was largely ineffective because teachers could not access the system's centrally served components. As a result of this effort, however, the BVI HS can now

use the SASI system for administrative tasks such as printing report cards.

The DOE maintains its commitment to SASI, and is preparing to re-launch an EMIS-focused TPD program to re-introduce the use of the software in primary schools. However, chief among the required preparations is providing teachers with access to computers in their classrooms and resource centers or other convenient locations.⁴

Administratively, both the MOE and the DOE conform to the government-wide mandate to use Lotus Notes as an information-sharing environment. Most of the personnel in both institutions have ICT skills and use computers routinely.

Nonformal, distance, and open education

Some primary schools offer computer-lab access after school hours. However, these programs—supported by the Department of Youth Affairs and Sports—mainly serve regular students.

⁴ As implemented by state and large district school systems in the United States, SASI requires significant teacher support in the form of coding guides, manuals, and TPD. It is possible that the limited number of schools, teachers, and students in the British Virgin Islands school system will enable phased introduction of some features and the use of the product without any need for customized curriculum and other codes.

A computer lab is located in one community center and computer training is conducted there. This training is available for use by adults, youth, and children.

A 2003 proposal for reorganization of school computing targets modernization of hardware and installation of computers in classrooms (as opposed to labs). This initiative, however, is moving slowly.

Barriers and challenges

- **Lack of hardware for teachers' use of ICT:** ICT programs have focused on providing computers for use by students at both the primary and secondary levels. Although teachers at both levels typically have basic ICT skills and are enthusiastic about the use of computers, they do not have sufficient access to computers for lesson preparation, classroom teaching and learning, or administration (including EMIS).
- **Lack of curriculum, software, TPD, and institutional capacity for technology integration:** Again, although teachers are both willing and skilled in relation to ICT use, the DOE itself does not currently have the resources necessary to support use of ICT to enhance teaching and learning across the curriculum. In addition to the need for hardware access—most labs are fully timetabled—teachers require formal curricula (including learning objectives or outcomes, standards, assessments) and professional development. Initial steps in this direction may need to rely on collaboration facilitators such as iEARN, Think.com, and others—with the attendant lack of linkage to the curriculum.

Lessons learned

- **TPD must be synchronized with access to tools to be effective:** In two instances—the first introduction of computers in primary schools in the 1990s and the launch of the EMIS program—TPD was provided to teachers in advance of their access to functioning versions of the tools that they were trained to use. As a result, adoption of the tools lagged seriously. In the case of the EMIS program, TPD will be repeated when all necessary systems are in place.
- **Intra-governmental partnerships and collaboration require ongoing outreach:** The DOE was able to turn the liability of its dependence on the government's IT Unit for computer maintenance into an asset by assiduously supporting that relationship. Meetings and communication, including the effort to convince the IT Unit of the importance of school computing and functional computers in schools, were required to ensure that technology issues in schools were addressed in a timely and effective manner. At present over 70 percent of computers in primary schools are kept functioning on a regular basis.

Cayman Islands

Summary

By providing financial services to over 68,000 businesses, the Cayman Islands has developed the strongest economy in the Caribbean, and enjoys one of the highest standards of living in the world based on per-capita GDP.

The Ministry of Education, Training, Employment, Youth, Sports & Culture (MOE) has launched an ambitious initiative to enhance teaching, learning, participation and administration through the use of ICT. As a result, Caymanian schools offer high levels of access to ICT to both students and teachers: almost all full-time permanent teachers have laptop computers; the student-to-computer ratio of 4:1 is among the most favorable in the world.

This extensive provision of hardware, however, has yet to yield the expected positive outcomes. Barriers including unreliable Internet connectivity, inadequate and poorly designed TPD, and uninspiring learning resources have limited teachers' efforts to integrate ICT across the curriculum.



Policy and planning

The Cayman Islands consists of three islands: Grand Cayman, Cayman Brac, and Little Cayman. In the absence of direct taxation, offshore financial services to businesses such as banks, insurance companies

Basic Data

Category	Date	Value
Population	2006 (est.)	45,436
Per capita GDP (PPP)	2004 (est.)	\$43,800
Economy, composition	2006	Financial services, tourism
Literacy, total population 15 and over	1970 (est.)	98%
Net enrollment ratio, primary	—	NA
Net enrollment ratio, primary (girls)	—	NA
Net enrollment ratio, secondary	2002	86.2
Net enrollment ratio, secondary (girls)	2002	86.1
Number of primary schools	2006	10
Number of secondary schools	2006	4
Language of instruction	—	English

Sources: World Factbook, UNESCO, The Natoma Group

Relevant Policies

Policy	Status	Date	Key points
Vision 2008 – The Cayman Islands Nation Strategic Plan 1999–2008	Adopted	1999	<ul style="list-style-type: none"> ■ Plan for national development, including education sector: ■ Computer literacy among teachers ■ ICT support for teaching and learning ■ Integration of ICT into the curriculum ■ ICT curriculum for primary and secondary students ■ ICT support for distance learning for adults ■ Community program in libraries, community centers and other access points
A New Curriculum for schools in Cayman Islands – draft for public consultation	Draft	In progress	<ul style="list-style-type: none"> ■ ICT curriculum ■ ICT integration ■ Wide range of technologies ■ Teachers will use ICT to enhance teaching and learning ■ All school-leavers will be literate, numerate, and computer literate

Sources: University College Cayman Islands, The Natoma Group

and mutual funds, dominate the Cayman Islands economy, with a strong contribution from the luxury-tourism sector. As a result, Caymanians enjoy the highest standard of living in the Caribbean and one of the highest in the world.

A new educational model was launched in February 2006, intended to promote student-centered learning across all levels. A Learning Communities concept was introduced as part of this program to encourage more ownership of students' performance by the community as a whole, and thus more involvement and support.

ICT in primary and secondary schools

As a result of the ITALIC program, described later in this section, both primary and secondary schools offer high levels of access to ICT to

students and teachers. Main measurable outcomes appear in improved student performance in ICT examinations.

Teacher professional development

Cayman schools require teachers to have B.Ed. degrees or bachelors degrees in specific subjects plus teaching certification.

Among tertiary institutions, the International College of the Cayman Islands (ICCI) offers a B.A. in liberal studies with an interdisciplinary arts/science concentration that is intended to satisfy requirements for primary-school teachers. The curriculum for this degree, and for all degrees at ICCI, includes an "Introduction to the Computer" course; degree requirements do not address integration of ICT into teaching and learning.

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools, government	10	Enrollment varies greatly	—
Secondary schools, government	4	Enrollment varies greatly	—
		Grand Cayman schools avg. ~850	
		Cayman Brac school enrollment is <500	

Sources: University College Cayman Islands, The Natoma Group

The ITALIC program

The principle ICT initiative in Cayman schools is the Improving Teaching and Learning in the Cayman Islands (ITALIC) program, launched in February 2002 in partnership with IBM Corporation as an outcome of the Vision 2008 plan. Key program objectives include teacher training, integration of learning software, Web-based resources, and new curricula in school-based teaching and learning, and increased (classroom-based) access to computers and the Internet.

Initial cost of ITALIC was approximately US\$16 million, with these costs borne by the MOE. IBM contributed technical support during the installation process. The project involved installation of computer hardware and Internet connectivity in 29 government schools, plus TPD for approximately 300 teachers.

In addition, Riverdeep, an IBM partner and services re-seller, was selected to provide educational and administrative software and services. Flagship educational software in the ITALIC program consists of Riverdeep's Destination Reading and Destination Math series, each of which supports standards-based curricula from pre-kindergarten through middle school.

The MOE also implemented the Riverdeep Learning Village portal, intended to facilitate collaboration and communication among all education stakeholders, including school leaders, teachers, students, parents, and others. Learning Village provides teachers with planning and administrative tools, and affords teachers and students the opportunity to develop rich-media content, collaborate in small and large groups, and interact with family members. Learning Village also supports EMIS.

Evaluation of the ITALIC project completed in 2006 by Dr. Hassan Syed, President, University College Cayman Islands, found that positive outcomes include overall increases in:

- Awareness of ICT as a learning tool among teachers and students
- Internet connectivity among government schools (100 percent)
- Student access to ICT
- Teacher access to ICT

Improvements in ICT access have been impressive: The 4:1 student-to-computer ratio in Cayman schools is among the most favorable in the world. (In comparison, ratios in Canada, the USA, and the UK are 6:1, 8:1, and 9:1 respectively.) Approximately 98 percent of full-time teachers have laptop computers.

Concomitant with increased access, teaching and learning of ICT has improved, as evidenced by test results.

Adoption of ICT as tools for teaching and learning, however, as well as overall improvements in learning outcomes, have not kept pace with these improvements in infrastructure. Negative and limited outcomes are discussed in the subsequent sections.

Internet and back-office services

The software-and-services package purchased by MOE from Riverdeep delivers Destination Reading and Destination Math via portals hosted on third-party servers and accessed by students and teachers using the Internet. As a result of this configuration, ITALIC has encountered two critical barriers to successful use:

- Internet connectivity is inadequate for teacher and student access to learning resources and other services
- MOE has no access to domain and database servers, limiting control over data and learning resources and compounding technical support issues

Internet connectivity is an important component in many educational environments. The decision to implement centrally hosted versions of educational software such as Destination Reading and Destination Math, as well as the Learning Village portal, multiplies the importance of connectivity. Although all Caymanian schools now have broadband connections via ADSL, reliable and adequate Internet access was made a critical component for the success of the ITALIC project.

The independent evaluation, however, found that: "The problem of access to networks has been highlighted by the end-users as the single most important factor in discouraging the use of ICT in the schools. This unstable and precarious network performance has resulted in restricted use of ICT in the classrooms" (Executive Summary, p. 13).

Technical support was found to be a second critical issue limiting adoption of the ITALIC curriculum and resources. All support services have been contracted to CDS, an offshore private sector vendor of ICT services. On-site support in schools involves delays and limited effectiveness. Technical-support problems are compounded, however, because only CDS has access to servers delivering learning resources and recording learner results. The MOE, for this reason, is unable to positively influence server up-time or to review data on demand.

ITALIC Teacher professional development

TPD under ITALIC has also been generally unsuccessful. Obstacles included:

- Rudimentary and incomplete training content
- Lack of relevance to the Caymanian curriculum
- Failure to calibrate training to teachers' varying ICT skill levels

As a result of these challenges—and in combination with the problems posed by inadequate connectivity and technical support—adoption of the ITALIC approach by teachers has been low.

An ITALIC pilot project did offer more comprehensive TPD. However, this project included no incentives for teacher participation and, because delivery was via e-learning, foundered on the project's over reliance on network-served resources and services.

Tertiary education

The MOE operates the University College of the Cayman Islands (UCCI), as well as a law school. Private tertiary institutions include the International College of the Cayman Islands (ICCI), St. Mathews University (SMU), and the Institute for Theological and Leadership Development. In addition, UWIDEC offers courses via distance education through UCCI.

Among the five departments at UCCI is the department of Computer Science and Technology. The department offers courses in computer science and in electronics, leading to an associate degree, professional certification (Microsoft, SQLServer, etc.), and general ICT certificate programs. The department operates three up-to-date computer labs to support these programs. In addition, UCCI

makes computer workstations and a wireless LAN, both connected to the Internet, available to students in the campus library.

ICT does not play a major role at the other Caymanian tertiary institutions, although SMU does offer online services for students and faculty, as well as wireless Internet connectivity on campus.

Barriers and challenges

- **Unreliable Internet access in schools:** Although ADSL networking in schools has the potential to deliver adequate bandwidth, poor quality telephone lines and service limit Internet performance.
- **Slow response-time of out-sourced maintenance:** Along with administration of ITALIC-program servers for learning services and data management, maintenance and repairs have been out-sourced to an offshore provider. Despite relatively new hardware and software, hardware problems in schools compound problems related to unreliable Internet access and unresponsive server maintenance. (Note that as of 2007, the MOE issued RFPs for Cayman-based maintenance providers.)
- **Inadequate skills among teachers:** ITALIC TPD has to date been ineffective, in terms of guiding teachers toward integration of ICT into the curriculum and in terms of helping teachers with some level of computing skills build relevant new skills.
- **Poor linkage of educational resources to curriculum:** Although the Riverdeep software packages available to primary and middle-school teachers and students provide reasonably complete language arts and math curricula, as with many off-the-shelf products the integration with classroom practices does not appropriately complement Caymanian classroom practices.

Lessons learned

- **Network-served resources increase the importance of reliability:** The Web-based versions of Riverdeep learning and administrative resources

were adopted for the ITALIC program. Although centrally served resources may require less support and may be more easily upgraded and modified, teacher and student access is completely dependent on reliable Internet access. Unreliable Internet connectivity has contributed to low levels of usage of these resources.

- **High levels of ICT access do not alone lead to enhanced teaching and learning:** Although

teachers and students both enjoy high levels of access to computers and to educational software, impact on teaching practices and learning outcomes have yet to be observed. While hardware and network access *is* critical, areas such as curriculum reform, appropriate learning resources, and TPD must be effectively planned and implemented to achieve improvement across the curriculum.



Dominica

Summary

Although the Commonwealth of Dominica's ICT policy in education has not been developed, both the MOE and schools themselves have made efforts to provide access and basic IT skills to students at the primary and secondary levels. The most significant initiative may be IT for Dominica, a partnership with schools in Alberta, Canada, that has used refurbished Canadian computers to establish communication between students and teachers in the two countries. In addition, a limited number of upper-secondary students are enrolled annually in elective courses leading to the CXC exams.

More elaborate efforts, including EMIS implementation and support for integration of ICT into teaching and learning across the curriculum have been in development but may not be high priorities at this time.



The economy of the Commonwealth of Dominica is primarily dependent on tourism and agriculture. Forty percent of Dominican workers are in the agricultural sector, with primary agricultural exports

Basic Data

Category	Date	Value
Population	2006 (est.)	68,910
Per capita GDP (PPP)	2005 (est.)	\$3,800
Economy, composition		Agriculture, tourism
Language of instruction	—	English
Literacy, total population 15 and over	2003 (est.)	94%
Literacy rate (girls)	2003 (est.)	94%
Gross enrollment ratio, primary		88.2%
Gross enrollment ratio, primary (girls)		85.0%
Gross enrollment ratio, secondary		85.5%
Gross enrollment ratio, secondary (girls)		92.8%
Telephone main lines	2004	21,000
Telephones mobile	2004	41,800
Internet hosts	2006	263
Internet users	2005	20,500

Source: World Factbook

Relevant Policies

Policy	Status	Date	Key points
Strategic Plan for Implementation of ICT's in the Education System of the Commonwealth of Dominica*	Not adopted	March 2004	<ul style="list-style-type: none"> ■ Integrate ICT in the school curriculum ■ Promote equitable access to educational resources through the strategic application of ICT ■ Provide computer literacy (requisite ICT skills) improving graduates' employability in the information economy ■ Create a teaching force with requisite ICT skills and competencies to enhance the teaching/learning process ■ Promote a cadre of ICT teacher specialists ■ Encourage and facilitate the use of the Internet as a research and communication tool ■ Improve the efficiency and effectiveness of educational administration by facilitating the implementation of an EMIS ■ Create partnerships for a sustainable ICT program among the public sector, private sector and communities ■ Establish schools network system for the collaborative sharing of educational resources and stakeholder participation.

* This policy document was created using the OERU template.

Source: MOE

including tobacco, bananas, vegetables, coconut oil, and essential oils.

Infrastructure

All primary and secondary schools have at least one Internet ready computer. One of the island's telecommunications providers (C & W) offers free Internet access. Initially, access was limited to a 56 Kbps dial-up connection; that connection has been upgraded to broadband access at 128K to 256K.

Computers in schools are used primarily for e-mailing and for creating and filing documents. In fewer than 10 schools educational software is being used, for mathematics and reading. At the primary level, software titles include: Reader Rabbit, World Book Encyclopedia, Inspiration, and Mavis Beacon Teaches Typing. At the secondary level educational

software includes: Video Professor, various subject-specific tools such as Chemistry, French, BodyWorks, Google Earth, Mavis Beacon Teaches Typing, AutoCAD, Inspiration and Turbo Pascal. Schools hold only one-user software licenses for these tools.

The IT for Dominica Project

The IT for Dominica Project (itfordominica.org) provides refurbished computers to schools and supports training of teachers and school administrators. A partnership with a school district in Alberta, Canada, the project began implementation in 2000. The main goals of the program are to provide access to ICT and training for Dominican teachers to improve collaboration between teachers and students in Canada and Dominica.

Initiatives involving use of ICT in education in Dominica that are supported by IT for Dominica also encourage participation in structured online discussion via the following projects:

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools, government	60	—	■ 32 have computer labs with an average of 8 machines
Secondary schools, government	15	—	■ 11 have computer labs with an average of 20 machines

Source: MOE

Relevant ICT Programs

Public Private Para-statal	Organization	Programs	Target Groups	Technology	Scale (No. of schools, no. enrolled, etc.)
Public	Dominican and Canadian Governments	IT for Dominica	■ Primary and secondary schools	■ 30 computer labs with 6 to 20 computers connected to the Internet	■ 3 secondary and 16 primary schools

Source: MOE

- **Global Teenager Project:** Participation in moderated discussion forums on varied themes <http://www.globalteenager.org/mambo>
- **Small Island Voices:** Connecting students in all school levels from small islands from all over the world <http://www.unesco.org/csi/smis/siv/sivindex.htm>
- **Young Foresight Program:** Providing an entrepreneurial view for the students through Internet-based communication targeted at the secondary level www.youngforesight.org

Students participate in IT for Dominica during designated class sessions. The issues discussed are usually of a current nature, and concurrent with topics being covered from the syllabus. Pre- and post-session discussions are held during social studies classes.

Teacher professional development

Pre-service teacher development takes place at the Dominica State College. The curriculum for the Associate Degree in Secondary Teacher Education requires completion of the ED7 Instructional Media course. ED7 is intended to prepare teacher trainees for the integration of instructional resources of all kinds—teacher-made resources, static media, electronic media, and computers—into teaching and learning.

IT for Dominica offers one two-week in-service course of ICT training per year targeting 40 teachers (2 groups of 20 teachers each). This training provides an opportunity for Canadian teachers and school administrators to share with Dominican

teachers and administrators best practices and functional skills in the use of ICT as a tool for teaching/learning. Candidates for the 2-week course are recruited through a selection process, and priority is given to teachers from schools already equipped with computer labs.

Secondary curriculum

In the 11 secondary schools with computer labs (out of 15 total schools), all students learn basic computer skills using Microsoft Office (Internet, word processor, spreadsheet, database, presentation) during their first three years. In their final two years, selected students may enroll in CXC General (programming skills) or Technical (Office applications) courses in preparation for CXC exams.

The computer/student ratio is 1:3 in the lower-level courses and 1:1 in the CXC preparatory courses.

Demand for enrollment in the CXC preparatory courses typically exceeds capacity, with access principally determined by scores on math exams. However, girls are generally well represented in ICT courses at all levels, in some cases outnumbering boys.

ICT Curriculum in process

A primary-level ICT curriculum guide is intended to support an integrated learning approach, which combines computer skills with teaching and learning in the traditional subject areas and changes in student assessment. However, release of a new national curriculum by the Curriculum Development Unit of the MOE may complicate use of the guide in schools by changing curriculum objectives, TPD, and other teaching-related components.

EMIS and use of ICT within the MOE

In Dominica, funding is considered the greatest hurdle to the procurement and implementation of an EMIS in Dominica. However, other obstacles, including lack of appropriate software products, limited telecommunication infrastructure, and lack of the necessary culture of reporting and accountability in schools, and limited EMIS experience within the MOE and in the Dominican private sector, suggest that EMIS planning should be approached cautiously.

Dominica has participated in efforts to synchronize efforts among the OECS grouping of islands to push the agenda for a regional EMIS that have been coordinated by the OERU.

Tertiary education

The Dominica State College offers an Associate Degree in Computer Science, as well as making computer-science courses available to all students as electives.

Tertiary-level students in Dominica access various technologies to access higher education at off-island institutions. Students participate in UWIDEC courses via teleconferencing. In addition, several UK-based universities, including Cambridge University and the Universities of London and Leicester, offer courses via e-learning or via blended learning (usually an online segment followed by a contact segment).

Non-formal learning

There are several community projects in Dominica funded by UNESCO and UNDP. Six media centers provide Internet access and basic computer training to the community for minimal fees.

Challenges

The two main challenges to the effective implementation of ICT in education in Dominica are lack of resources—including physical, financial, and human resources—and lack of curriculum guidance for the ICT division.

However, as with EMIS procurement, the limited “ICT culture” in Dominica is an important if less

tangible factor as well. ICT in all of its forms is entirely new to the island, more particularly to the rural communities. There are urgent needs to be tackled in order to make technology accessible and valuable in these communities. These include experience and training in critical activities, such as maintenance, training of community members, community outreach, and the establishment of key local partnerships.

Lessons learned

The Lessons Learned section has been contributed by Mr. Abraham Durand, Director of the ICT Division of the MOE, in the form of a reflection on the history and current state of ICT in education in Dominica.

- The computer is an “expensive guest,” which requires huge investments in infrastructure, equipment and maintenance, and servicing of equipment. Good solid software is also expensive and requires monitoring and review. In addition, training needs to be given to teachers if the integration of ICT in the teaching/learning process is to be effective and have a lasting productive impact on the education of youth and by extension on the country’s economic development.
- However, it is acknowledged that ICT opens up huge possibilities for learning and access to the huge vault of information and opportunities that the Internet, electronic storage, and transmission of information make possible. The IT for Dominica Project has assisted greatly in providing the kind of constructive inputs that have helped to overcome the obstacles posed to ICT implementation in the form of physical and human resources. The project has demonstrated the significance of private/public sector/ NGO collaboration that lends itself to integrated development, both economic and society-wide. These initiatives, however, have to be closely monitored and managed in such a way that they lead to effective transfer of human capital to the economy, as well as creating opportunities and entrepreneurship in the international arena.

Summary

Use of ICT in schools in Grenada is not extensive. The primary and secondary schools are using ICT on a pilot basis. Two secondary schools offer students access to computer labs to enable preparation for the CXC ICT exams. However, the MOE has initiated two innovative programs: in the first, expatriate Grenadian university students and others are invited to return to Grenada to assist with ICT maintenance; the second, still in development, is television programming intended to strengthen children's decision-making abilities.

Grenada has among the lowest rates of per capita GDP in the Caribbean. Resources for ICT in schools have historically been limited.

In 2004, Hurricane Ivan devastated the island, with negative impacts on schools and the education system that continue to be felt.



Overall, the use of ICT in schools and throughout the education system has not progressed at a rate approaching that of larger neighbors Barbados or Trinidad and Tobago, or to the extent of some of the

Basic Data

Category	Date	Value
Population	2006	89,703
Per capita GDP (PPP)	2005	\$3,900
Economy, composition	2006	Tourism, manufacturing, construction, financial services
Literacy, total population 15 and over	2003	96%
Literacy rate (women)	—	NA
Gross enrollment ratio, primary	2002/3	119.6
Gross enrollment ratio, primary (girls)	2002/3	118.6
Gross enrollment ratio, secondary	—	NA
Gross enrollment ratio, secondary (girls)	—	NA
Number of primary schools	2006	450
Number of secondary schools	2006	22
Language of instruction	—	English

Sources: World Factbook, UNESCO, MOE

smaller islands such as St. Lucia. Two secondary schools have labs at present, with computers used for preparation for the CXC ICT exams and to reinforce math and science learning.

The MOE has, however, initiated two innovative programs. First, to address lack of maintenance and repair capacity, expatriate alumni, such as students at universities abroad, are invited back for two months during summer to assist with repairs and maintenance. Second, to support children's decision-making in relation to life choices and their relations with others, as well as their self-esteem, the MOE has launched development of a television program. As a first step, 15-minute scripts have been solicited from schools and students.

With a population of approximately 89,000, Grenada is among the smallest countries in the Western Hemisphere. Per capita GDP of US\$3,900 is among the lowest in the Caribbean; 32 percent of Grenadians live below the national poverty line. The services sector is the economy's largest (62 percent), followed by agriculture (24 percent), and manufacturing (14 percent).

In September 2004, Grenada suffered widespread devastation resulting from the landfall of Hurricane Ivan. Schools were destroyed, with concomitant damage to school computer facilities. In most instances, damaged computers have yet, as of early 2007, to be replaced.

Policy and planning

The MOE is developing an ICT policy in education. Working closely with OERU personnel, MOE is

Relevant Policies

Document	Status	Date	Key points and objectives
ICT Policy in Education	Draft in development	2007	Not known

Source: MOE

revising that organization's policy template to reflect conditions and objectives in Grenada.

ICT in Schools

Beginning in 2003, the MOE with funding from OAS has introduced ICT into primary and secondary schools on a pilot basis. No evaluation results are available.

A program is underway to address the critical challenge of maintenance with an innovative model. At present, MOE is responsible for providing maintenance and repair services, however, lack of capacity and lack of resources render technical support a critical challenge. To address this, once every year, young Grenadians attending community college abroad are invited back to the country to visit schools and provide maintenance and repairs.

The MOE has in 2007 initiated development of educational-television programming.

Primary schools

In the aftermath of Hurricane Ivan conditions in primary schools remain substandard, with several

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools, government	—	—	—
Primary schools, private	—	—	—
Secondary schools	22	—	<ul style="list-style-type: none"> ■ 2 schools have labs with 25 computers ■ Labs have ADSL connections to the Internet ■ All secondary schools have administrative computers and dial-up Internet connections

Source: MOE

schools still not open. A portion of current OAS funding targets school reconstruction. Administrative computers and other ICT facilities have yet to be replaced in the schools in which they were damaged

Secondary schools

Of the 22 secondary schools, two have two computer labs each, partially funded by OAS. Twenty-five computers were installed in each lab; labs are connected to the Internet via ADSL. In late 2006, MOE was finalizing a contract with C & W to supply all schools, which currently have at least one administrative computer, with ADSL connectivity. (Currently, schools have dial-up Internet accounts.)

The main use of labs in the two schools that have them is preparation for the CXC ICT exam. However, students in these schools also use computers to reinforce math and science learning.

Educational television

MOE has initiated development of the “Character Counts” television series. The development process has begun with an invitation to schools to support the initiative by creating 15-minute scripts focusing on: trustworthiness, respect, responsibility, fairness, caring, and citizenship. Schools are asked to encourage students to participate in developing the scripts.

Teacher professional development

TPD is primarily delivered as pre-service education in the T.A. Marryshow Community College, which offers both teaching certificates and B.Ed. degrees. The college has an ICT facility, but the level of access afforded education students is not known. The community college also offers pre-service TPD for new teachers.

Within the last five years, UWI offered a workshop to 25 Grenadian teachers on the integration of ICT into the classroom curriculum. Although the workshop was well received, teachers’ limited access to computers compromised teachers’ retention of skills, techniques, and knowledge.

Tertiary education

Tertiary education in Grenada is provided by the T.A. Marryshow Community College, which was formed in 1998 by merger of nine pre-existing colleges, institutes, and schools. These included the Grenada Teachers College, as well as several organizations providing technical or vocational education.

The community college offers a two-year Certificate in Further Education in Information Technology. Levels of access to ICT afforded students in other programs (including teacher development) are not known. Preparation for the CAPE ICT exam is not available at the college.

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
T.A. Marryshow Community College	Pre-service primary teachers	<ul style="list-style-type: none"> ■ 2-year certificate in Teacher Education ■ 4-year B.Ed. ■ ICT available on campus 	—	—
T.A. Marryshow Community College	In-service primary and secondary teachers (New hires)	—	—	—
UWI	In-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Provide teachers with basic IT skills ■ Train teachers to integrate technology into their regular curricula 	■ 25 teachers	<ul style="list-style-type: none"> ■ Teachers’ limited access to technology in schools ■ Limited number of teachers trained ■ One-time program

Sources: MOE, The Natoma Group

Nonformal, distance, and open education

The UWI Learning Center offers adult-education classes using distance learning. In a second program, a Montessori program in Mexico provides training to community workers using a satellite connection.

EMIS and use of ICT by MOE

Respondents in Grenada report that OERU is revisiting selection of an EMIS product, with possible funding from CDB. Although apprised of the initiative, the MOE does not at present have a position on EMIS.

As mentioned, capacity for technical support within MOE is inadequate. The MOE is among the several Grenadian ministries that do not support web sites or web pages linked to the national government's web site. (The ministries of agriculture, finance, and tourism are the exceptions.)

Barriers and challenges

- **Funding:** In 2004, many schools were severely damaged, with damages including loss of computers (primarily administrative). These computers, and several entire primary-school facilities, have not been repaired or restored.

Summary

Jamaican schools were among the first in the Caribbean to acquire computers and Internet connections. The Jamaica 2000 project led to the installation of computer labs in all secondary schools to support courses in computer studies and computer science. Jamaica 2000 is now succeeded by e-Learning Jamaica (e-LJam), a more comprehensive project addressing overall enhancement of teaching and learning using ICT to support constructivist pedagogy, authentic assessment, and other change strategies. Several primary-level initiatives planned pilot projects that were to lead to scaled implementation of ICT, however these projects were in some cases either substantially curtailed (New Horizons Project), not sustained (Ed Tech 20/20), or have yet to be completed (Primary Education Sector Project). According to a 2006 baseline survey, substantial investments and large-scale initiatives at both the primary and the secondary levels have yet to yield



significant impact in terms of access to ICT or ICT support for educational reform. Progress at the tertiary level has been steadier, with all of Jamaica's tertiary institutions offering combinations of certificate, diploma, and degree programs in ICT-related disciplines. Teachers' colleges, however, and in-service training programs for teachers in general, do not yet support emphasis on ICT that is commensurate with the history of commitment and ambition. The TVET organization HEART Trust/

Basic Data

Category	Date	Value
Population	2006	2,758,124
Per capita GDP (PPP)	2005	\$4,500
Economy, GDP composition by sector	2006	Agriculture (4.9%), industry (33.7%), services (61.5%)
Literacy, total population 15 and over	—	84.1%
Literacy rate (women)	—	91.6%
Gross enrollment ratio, primary	2002/3	99.8%
Gross enrollment ratio, primary (girls)	2002/3	99.5%
Gross enrollment ratio, secondary	2002/3	84.1%
Gross enrollment ratio, secondary (girls)	2002/3	85.1%
Number of primary schools	2006	355
Number of secondary schools	2006	—
Language of instruction	—	English

Sources: World Factbook, UNESCO, The Natoma Group

NTA offers perhaps the most comprehensive and effective support for developing ICT capacity, requiring computer proficiency at all 27 of its campuses and offering more advance technical certification at six computer labs nationwide.

The most populous country included in this critical review,⁵ Jamaica has the most extensive and varied history of ICT use in education. In addition, the island hosts several key regional education institutions or initiatives, including UWIDEC, the HEART Trust/NTA, and the Caribbean Regional Sustainable Tourism Development Program.

The Jamaican economy, however, has experienced troubles stemming from a variety of causes. These range from political violence in the 1970s, to organized crime and neighborhood violence in the 1980s and after, to problems in the financial sector that include inflation, unemployment, and high internal debt, to weather events such as drought (1997) and catastrophic hurricanes such as Gilbert (1988) and more recently Ivan (2004).

In combination with the economy's reliance on the service sector, these economic challenges and the resulting island-wide low-income levels make improvement of the effectiveness of education in Jamaica a high priority. As of 1999, the Government of Jamaica allocated 12.9 percent of its overall budget to education. Key challenges, however, include poor student performance, inequities within

the system based on race, class, and gender, and limited access to secondary education.

Unfortunately, Jamaica's relatively long history of experimentation with ICT has yet to bear substantial fruit.

Policy and planning

Although Jamaica continues to launch large-scale projects in ICT, with strong support from the office of the Prime Minister, activities are yet not guided by policy or by a strategic plan. A strategic plan was developed at the end of 2006, leading to the drafting of a new ICT policy in education that has yet to be adopted. The policy includes support for e-LJam.

Primary education

Starting in 1998, MOEY has worked to ensure that all primary schools with electricity have had at least one computer with Internet. In addition, several projects have increased access to ICT and technical capacity at the primary level. These include:

5 The more populous countries in the Caribbean—Cuba, the Dominican Republic, Haiti, and Puerto Rico—have been excluded so as to enable concentration on SIDS.

Relevant Policies

Policy	Status	Date	Key points
ICT Policy for Education*	Draft	December 1998	<ul style="list-style-type: none"> ■ Promote equitable access to education through ICT ■ Create a teaching force with skills required to use ICT to enhance the teaching/learning process ■ Improve the efficiency of educational administration ■ Provide support to distance education and lifelong learning
RFP for ICT Strategy	Published	October 2006	<ul style="list-style-type: none"> ■ MOEY has advertised for a consulting firm to guide development of a strategic plan
ICT Policy for Education Sector**	Announced draft	September 2007	<ul style="list-style-type: none"> ■ Unknown, but includes statement of support for e-LJam

* Although the document is cited in Miller (see the List of Works Consulted, in Volume 1 of the Survey), the title of the policy is unknown. It does not appear that the policy was adopted. The current education planning document, a white paper titled "Education: The way upward—A path for Jamaica's Education at the Start of the New Millennium", does not list ICT use among its seven strategic objectives.

** Although the new policy had not been released in draft form as of publication of the Survey, announcements appeared in September and November of 2007 stating that the draft was nearing completion (Jamaica Information Service, Sept. 27, 2007, and Nov. 11, 2007 – http://www.jis.gov.jm/education/html/20070926T120000-0500_13093_JIS ICT_POLICY_FOR_EDUCATION_SECTOR.asp – Accessed Nov. 21, 2007.* This policy document was created using the OERU template.

Sources: MOEY, The Natoma Group

ICT Resources in Primary Schools

School type	Number	Median enrollment	ICT profile
Primary schools, public	355	—	■ At least 1 computer with Internet connection in all schools with electricity
All-age schools, public (primary and lower secondary)	88	—	■ 15 pilot Primary Education Support Project (PESP) schools with ICT installations and teacher development

Source: MOEY

Ed Tech 20/20

The Jamaica Computer Society Education Foundation (JCSEF) with funding from IDB and the World Bank⁶ launched a cluster-based approach to ICT in primary schools, Ed Tech 20/20. The project pilot-tested computer-and-Internet installations in roughly 20 primary schools. Clusters of four to five primary schools were linked to a single secondary school or teachers college, which would provide professional development and technical support.

New Horizons Project (NHP)

Primary intended to increase literacy and numeracy levels among students in 72 primary schools, the NHP originally included plans for installation of computer labs in 15 primary schools, with audio-visual equipment provided to the remaining 57 schools. Over the course of the seven-year project, ICT-related objectives were revised to target establishment of 6 “hub” multimedia centers that were to provide shared resources to schools in their regions. In 2001, this target was further revised as a result of financial issues surrounding NHP and questions arising around management and sustainability of the centers, leading to the development of a pilot Education Technology Resource Centre (ETRC).

Primary Education Support Project (PESP)

Funded by loans of over US\$40 million, PESP was launched in 2001 as a comprehensive and holistic enhancement of teaching and learning at the primary level through qualitative improvements, civil works, and institutional strengthening. Curriculum and assessment initiatives, complemented by professional development of over 7,000 teachers plus additional professional-development activities, and school construction and maintenance programs comprise the central initiatives in the

project. The ICT sub-component has deployed hardware in 15 pilot schools, with professional development for the principal and one teacher in each school addressing use of office-productivity software and integration of ICT into the curriculum. PESP may also include audio-cassette-based Interactive Radio Instruction programming in math.

The PESP project is designed to be scalable within the Jamaican primary-school system, and to lead to a gradual increase in the effective use of ICT to enhance teaching and learning, with specific emphasis on the transition from “transmissionist” to “constructionist” pedagogies. The latter are considered within PESP to be more supported more effectively and organically by ICT.

Cable & Wireless Jamaica Foundation/Teens for Technology

In late 2006 and 2007, the telecommunications provider Cable & Wireless Jamaica, Ltd., in collaboration with the NGO Teens for Technology provided computers and free DSL Internet access (where available) to 108 Jamaican primary and secondary schools. Schools were selected to receive computers based on need and prior initiative in acquiring and using ICT.⁷

Secondary education

The major implementation of ICT in Jamaican secondary schools is the Jamaica 2000 project.

⁶ Ed Tech 20/20 was among the first project funded by infoDev, which has provided grant-based funding for the current study.

⁷ As of the drafting of the Survey, no information is available about the organization Teens for Technology, or about plans for TPD or technical support in participating schools.

Jamaica 2000/The Jamaica Computer Society Education Foundation

The Jamaica 2000 project was among the first Caribbean initiatives to target the nation-wide introduction of ICT into secondary schools. In 1989, the Jamaica Computer Society determined that over the subsequent decades Jamaica was likely to fall further behind developed countries due to a lack of computer-programming capacity and overall technical skills. In 1990 Jamaica 2000 was launched—as well as an implementing organization, the JCSEF, an NGO—to increase the capacity of IT teachers in schools, ensure that computer science was an examinable subject in CXC-affiliated countries, and to provide each of the 144 Jamaican secondary school (as of 1989) with a 15-computer lab. Over the course of the next decade, several organizations would partner with JCSEF (HEART Trust/NTA and the Business Partners organization), while the MOEY and the Government of China partnered to separately equip 29 secondary schools not served by JCSEF.

Over time, the JCSEF modified its objectives to include the improvement of teaching and learning

in Jamaican secondary schools. Although lab installation met desired levels—with assistance from MOEY as mentioned—overall impact of the Jamaica 2000 project has been limited. For analysis of the results of Jamaica 2000 and related efforts, see the “Current state of ICT in Jamaican schools” section included in this profile.

Teacher professional development

The tertiary institutions below offer pre-service teacher education.

In-service

The MOEY has a Professional Development Unit (PDU) that is responsible for in-service TPD. Staff of the PDU includes an ICT Training Coordinator (as well as a training coordinator for NHP). At the primary level, MOEY has tended most recently to focus its ICT in-service efforts on school leadership: In the past four years, over 200 principals have participated in one-year leadership courses address-

Pre-Service Teacher Professional Development Programs

TPD program type	Target population	Objectives/Degrees	Scale	Barriers
CASE	Students preparing to teach in primary programs	<ul style="list-style-type: none"> ■ Diploma in primary teaching ■ 3-year Curriculum includes a 1-semester course in education technology 	■ Unknown	<ul style="list-style-type: none"> ■ Limited access to ICT on campus; lack of integration into students' learning processes ■ Single course in education technology may fail to prepare students to use technology effectively
Knox Community College	Students preparing to teach in primary or secondary programs	<ul style="list-style-type: none"> ■ B.Ed. specializing in primary or secondary education 	■ Unknown	<ul style="list-style-type: none"> ■ Technology infrastructure on 3 of the colleges 4 campuses is limited ■ No ICT component is listed in the degree requirements
NCU	Students preparing to teach in early-childhood, primary, secondary and other programs	<ul style="list-style-type: none"> ■ B.A. and B.S. degrees as credentials for teaching 	■ Unknown	<ul style="list-style-type: none"> ■ No ICT requirement, but computer studies can be chosen as a major or minor area of specialization
UTech	Students preparing to teach in TVET programs	<ul style="list-style-type: none"> ■ B.Ed. degree 	■ Unknown	<ul style="list-style-type: none"> ■ Unknown; lack of access to technology in schools may lead to loss of skills, high turnover, etc. Core courses include: information technology; instructional technology; computer-based learning design
UWI	Students (including certificate or diploma holders from teachers colleges) preparing to teach in primary or secondary programs	<ul style="list-style-type: none"> ■ B.Ed. degree 	■ Unknown	<ul style="list-style-type: none"> ■ Unknown; available majors do not include instructional technology or computer studies

Sources: MOEY, UWI, The Natoma Group

In-Service Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
Ed Tech 20/20	Primary teachers	<ul style="list-style-type: none"> Enhance teaching and learning, in part through use of ICT 	<ul style="list-style-type: none"> 20 primary schools (unclear the number of teachers trained per school) 	<ul style="list-style-type: none"> Primary teachers trained by secondary teachers; unclear motivations/incentives/capacity
New Horizons Project (NHP)	Primary teachers	<ul style="list-style-type: none"> Improve literacy and numeracy learning 	<ul style="list-style-type: none"> 72 primary schools 	<ul style="list-style-type: none"> Initial plans for 15 multimedia centers scaled down to 1 center
Primary School Enhancement Project	Primary teachers, principals	<ul style="list-style-type: none"> Enhance teaching and learning through integration of ICT 	<ul style="list-style-type: none"> Systemwide; TPD for 7,000 primary teachers 15 pilot schools with ICT installations 	<ul style="list-style-type: none"> Limited use of ICT Limited scale of ICT-focused TPD (only one teacher and the principal from each of the 15 pilot schools)
Jamaica 2000	Secondary IT teachers, other secondary teachers	<ul style="list-style-type: none"> Increase capacity for teaching of computer-science; enhance teaching and learning through use of ICT 	<ul style="list-style-type: none"> 166 Jamaican secondary schools 	<ul style="list-style-type: none"> Project apparently focused on hardware acquisition and installation Limitations of cascade model Rapid changes in field of Computer Science
e-Learning Jamaica	Secondary teachers and principals	<ul style="list-style-type: none"> Enhance teaching and learning through integration of ICT 	<ul style="list-style-type: none"> 1 teacher and 1 principal in all 166 Jamaican secondary schools 	<ul style="list-style-type: none"> Learner-centered pedagogies don't match teachers or students needs for CXC performance Limitations of Cascade model of TPD Complex array of proposed technologies increases burden on TPD 3-year project timeframe is very short

Sources: MOEY, e-Learning Jamaica, The Natoma Group

ing ICT as part of a broader transformation of teaching and learning.

In addition, each of the projects described in this country profile—NHP, PESP, Ed Tech 20/20, Jamaica 2000, e-LJam—has provided professional development to groups of primary or secondary teachers to support specific uses of ICT. In most cases, the cascade model (or the “champion teacher” model) has been used. For this reason, overall coverage relative to the number of teachers in Jamaica appears limited; information about the number of teachers trained by peers is not available.

The NHP project also included development of an EdTech unit responsible for training and professional development of teachers, education officers, NHP associates, and parents. The NHP training curriculum addressed both the use of ICT and the transition to the NHP curriculum. A series of tutorials for self-paced learning was developed, addressing topics that ranged from a “Sensitization Seminar” to digital storytelling.

Overall, however, the salient features held in common by the TPD components of ICT projects in Jamaican schools are striking. At the primary level (NHP, Ed Tech 20/20, PESP), the scale of training (and of ICT installation) is extremely small, leading to the conclusion that no ICT interventions in primary schools have achieved widespread impact. At the secondary level, both Jamaica 2000 and eLearning Jamaica, Ltd., appear focused first on hardware procurement and installation, underemphasizing TPD.

Tertiary education

EMIS and Integration of Technology by MOEY

In addition to its regional leadership in terms of ICT implementation in schools, in 1993 Jamaica also became one of the first countries in Latin America to launch an EMIS initiative. Funded by USAID, this project was intended to strengthen support for information-based decision-making through improved access to school census data, introduction

ICT Programs in Tertiary Institutions

Institution	Target population	Objectives / degrees	ICT
Northern Caribbean University (NCU)	Undergraduates	<ul style="list-style-type: none"> ■ B.Sc., Computer Science with communications emphasis, Computer Science with programming emphasis, Information Science ■ A.Sc., Information Science 	■ Unknown
UTech, School of Computing and Information Technology	Undergraduates	<ul style="list-style-type: none"> ■ B.Sc. degree, Computing and Information Technology, Computing with Management Studies ■ Diploma, Computer Studies 	■ 6 laboratories with 150 up-to-date workstations
UWI	Undergraduates	<ul style="list-style-type: none"> ■ B.Sc., Computer Science, Computer Studies ■ B.Ed., various majors 	■ Yes, quality and level of access is unknown

Sources: UTech, UWI

of computer-based recordkeeping systems in all regions, development of a school-level GIS system, and other measures. EMIS development was completed in 1996, however several important components (including GIS) were not adopted.

As a measure of the limitations of that original system, at a much later point the NHP proposed development and implementation of a Jamaica School Administration Software (JSAS) package—to meet on a local level information needs that had supposedly been met nationally.

As of September 2006, MOEY announced plans to modernize its operations via acquisition of approximately 400 desktop and laptop computers, improvement of data storage and access capabilities, and ICT training for administrative personnel.

TVET

HEART Trust/NTA offers vocational training for secondary-school graduates and all school-leavers

age 17 and older in 27 institutions on an island-wide basis. All students receive basic training in the use of ICT. With a projected enrollment of 101,000 in 2007–2008, HEART Trust/NTA may be the educational institution with the broadest level of impact in terms of ICT capacity among Jamaica's general population.

In addition, the HEART Trust/NTA has three special initiatives involving use of ICT:

- **LMS roll-out:** HEART Trust/NTA is in the process of launching an LMS to provide self-paced e-learning to enrolled students
- **National Qualifications Register:** HEART Trust/NTA is developing an online database to aid its graduates in finding jobs and to aid prospective employers in finding new hires⁸
- **Vocational Training Development Institute:**

⁸ The HEART Trust/NTA is funded by a 3 percent employment tax, based on a company's number of employees; companies hiring HEART Trust/NTA students receive exemptions from the tax.

ICT Programs in TVET Institutions

Institution	Target population	Objectives/certificate	ICT
Caribbean Institute of Technology	Post-secondary students (at least 4 CXC passes)	<ul style="list-style-type: none"> ■ 12-month certificate programs in software design, networking, web design, etc 	■ Yes
HEART Trust/NTP	Post-secondary students (and early school-leavers)	<ul style="list-style-type: none"> ■ 12 and 24-month programs ranging from hospitality to auto mechanics ■ ICT basics are required 	■ Six labs, plus planned implementation of eLearning (via LMS)
UTech	Post-secondary students	<ul style="list-style-type: none"> ■ Many vocational programs; ICT certificates offered 	■ Yes

Sources: HEART Trust/NTP, UTech

Six computer labs at HEART schools, supporting ICT certificate programs

UTech also offers ICT-focused and ICT-supported TVET. In 2006, the university received a technical-assistance loan of USD 980,000 to enhance UTech's use of technology.

In addition, the Cisco Networking Academy program has established two training facilities in Jamaica.

For additional information, refer to the section, "Project profile: HEART Trust/NTA, Jamaica."

Nonformal education and community access to ICT

Jamaican schools support community access to ICT to a limited extent. Roughly, 12 percent of schools offer evening classes in computer studies, and of the 103 schools that offer classes, 95 (or 92 percent) report significant attendance by local adults and youth.⁹

In 2002, IDB approved a US\$17 million loan to the Government of Jamaica to develop ICT capacity both within the government and among low-income communities. Of the total loan, US\$3.5 million was allocated to fund the establishment of approximately 60 community information centers, each with five computers, with scholarships for community users and other program support.

Limited ICT capacity in Jamaican schools

In 2006, MOEY commissioned an assessment of overall ICT capacity in Jamaican primary and secondary schools, "Baseline survey on Information and Communication Technology Capacity in Schools in Jamaica."¹⁰ Although additional disaggregation of data is in order, the overall picture of ICT capacity is clear: Although Jamaica has historically been a leader in pilot-level ICT projects, with MOEY and JCSEF additionally leading systemwide implementations, technical and human capacity in schools remains limited. Key findings include:

- **Limited EMIS:** Many schools were unable to provide numbers of students by grade, or the number of students with access to computers
- **Lack of access to ICT:** The research teams were unable to check computers for operability in many schools, for reasons that include lack of

electricity, missing lab keys, unknown passwords, and equipment in storage or in principals' offices.

- **Computers non-operational:** Of the computers that could be accessed, roughly 22 percent are non-functional. Although this percentage is not atypically high, when combined with the number of computers that could not be checked, the numbers of non-operational computers is very significant.
- **Lack of ICT personnel:** 65 percent of schools reported that they did not have ICT coordinators; in many other cases, ICT coordinators were minimally trained or self-trained.

The report also expresses concern about the level of ICT capacity among school faculty. Ninety percent of teachers responding stated that they can use computers, with 61 percent reporting that they use computers in their teaching (i.e., grades, lesson preparation, etc.) and a further 21 percent reporting that they use computers for instructional delivery. However, only 40 percent of teachers overall are certified. However because these data are generated by self-reporting, and in light of the limited access to ICT in schools, the authors of the report remain skeptical as to teachers' ICT capacity and usage.

Lessons learned

Jamaican respondents and the reports consulted have in many instances not pointed to specific lessons learned. The scale of MOEY and the number of NGOs and other organizations active in ICT in Jamaica may limit the growth of shared knowledge. Ms. Jacqueline Cousins, head of the Media Services Unit, MOEY, had the following to say in distinguishing PESP from its predecessors, NHP and Ed Tech 20/20: "Simply supplying equipment without the other components, we would have the same experience and are now having that experience, in which you go through a first and second generation [of technology inputs] without seeing an impact on practice."¹¹

⁹ No information is available about the distribution of these programs among primary and secondary schools. Given that secondary-school computer labs are typically larger and IT teachers better trained, it is possible that most of the 103 schools offering classes to their communities are secondary schools.

¹⁰ The report was conducted by JCSEF and the INFOSERV Institute of Technology.

¹¹ Telephone interview, October 10, 2006.



Summary

Montserrat, a small island protectorate of the United Kingdom, has been ravaged by volcanic eruptions since 1995, resulting in significant out-migration as well as economic challenges. Although development of ICT policy in education has been stalled, three of four primary schools have acquired computer labs and software via *ad hoc* means. With support from the MOE, the Montserrat Secondary School has acquired two computer labs, which are used to support the use of office-productivity tools by students at all levels and to prepare students for the CXC ICT exam. All teachers have participated in TPD focused on development of basic ICT skills. Both tertiary institutions also offer instruction in basic ICT. The government supports public access computing

through an information kiosk, a library-based ICT program, and other means.



Basic Data

Category	Date	Value
Population	2006	~5,000*
Per capita GDP (PPP)	2002	\$3,400
Economy, composition	2006	Public sector construction, tourism, agriculture, rum, textiles, electronic appliances
Literacy, total population 15 and over	1970	97
Literacy rate (women)	1970	97
Gross enrollment ratio, primary	—	NA
Gross enrollment ratio, primary (girls)	—	NA
Gross enrollment ratio, secondary	2002/3	103.4
Gross enrollment ratio, secondary (girls)	—	NA
Number of nursery schools	2006	3
Number of primary schools	2006	4
Number of secondary schools	2006	1
Language of instruction	—	English

* The *World Factbook*, which provides population data included in this study, lists the 2006 population of Montserrat as 9,439. The *World Factbook* also states that over half of the population expatriated by the Soufriere Hills eruption has returned to the island. Montserratian respondents, however, suggest that both the total population and the numbers of returnees are overstated.

Sources: World Factbook, UNESCO, Min. of Education and Labor

Relevant Policies

Document	Status	Date	Key points and objectives
Draft policy on ICT in education	Draft	1998 and ongoing	<ul style="list-style-type: none"> ■ ICT is a priority for the education system ■ All secondary students should develop ICT skills ■ Each secondary student should be timetabled into ICT-focused learning

Source: Min. of Education and Labor

In coordination with the Government of Montserrat, DFID and the EDF plan a substantial increase in support for ICT in education in 2007–2008.

Although Montserrat is a British protectorate, per-capita GDP is among the lowest in the Caribbean. In its 2005/2006 fiscal year, DFID provided £12.5 million.

Introduction

One of the Leeward Islands, Montserrat is both very small (102 sq. km.) and lightly populated (~5,000). The island was devastated by eruptions of the Soufriere Hills Volcano from 1995 until the most recent eruption in 2003, which resulted in out-migration of over 60 percent of the population. (A significant proportion of expatriates have returned.) These eruptions also led to the closing of schools, displacement of students, and the construction of temporary school facilities in the northern, inhabitable region of the island. Following the eruptions, most of the businesses in Montserrat relocated to the city of Brades.

Historically, C & W has been the only telecommunications provider licensed to operate in Montserrat. Sector liberalization is in process and is intended to increase competition, drive down costs to consumers, and stimulate Internet use.

Policy and planning

A 1998 drafting of an ICT policy in education was interrupted by the volcanic eruptions and forced relocation of the island's inhabitants. The 1998 draft will be reviewed and revised prior to adoption.

As a result of DFID-supported technical assistance, an ICT audit of schools was conducted. Results of this audit will inform the types of technical assistance afforded the Montserrat Secondary School over the next several years.

Other donors supporting ICT in education in Montserrat include Eastern Caribbean Central Bank, CARICOM, and the Seventh Day Adventist church (which donated two computers to Montserrat Secondary School).

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Nursery schools	3	—	<ul style="list-style-type: none"> ■ Two schools have one computer for use by teachers ■ Computers are connected to the Internet
Primary schools	4	—	<ul style="list-style-type: none"> ■ Two schools have computer labs ■ One school has a small computer area ■ One school does not have computers ■ Three schools have Internet connections
Secondary school	1	—	<ul style="list-style-type: none"> ■ Two computer labs ■ Instruction in basic computing, Internet searching, and other topics ■ Preparation for CXC or CSEC IT exams

Source: Min. of Education and Labor

ICT in primary and secondary Schools

Primary schools

Notwithstanding the absence of an ICT policy and project plan, three primary schools in Montserrat have acquired computer labs and ADSL Internet connections through the MOE and local donors. The computers are of various brands, configurations and capacities, with refurbished computers comprising a significant portion of computers in one school.

In some primary schools, students in grades 5 and 6 have been introduced to computers—the extent of hands-on experience is unclear. Plans include efforts to increase the use of ICT among primary students.

Two of Montserrat's three nursery schools have one computer with ADSL Internet connection.

Secondary school

The Montserrat Secondary School currently has two computer labs with ADSL Internet connections. All students in the school are introduced to ICT as a subject. In the upper levels, students prepare to write the CXC and CSEC IT exams. The pass rate for Montserratian students taking these exams has been over 90 percent to date.

Teacher professional development

All 28 secondary teachers and 37 primary and pre-primary teachers have received in-service TPD in basic computer skills. Although professional development does not address ICT integration, many teachers use ICT for research and lesson-preparation, for presentations, and to support teaching and learning in other ways.

Since 1998, teachers in the education system have received some training in basic computer skills and general ICT. Staff turnover, however, has been such that current teachers will require further TPD.

Distance education and other media

The MOE also broadcasts radio and television programming to students in classes. Programming supports intramural competitions in language arts, math, science, and other subjects.

The UWI School of Continuing Studies (UWI SCS) offers some degree programs via UWIDEC

Tertiary education

Tertiary institutions include the Montserrat Community College and the UWI SCS. The community college offers an advanced-level program, which includes Information Technology as a subject. This program enables students to write CXC and CAPE examinations in IT.

Both the community college and UWI SCS offer new-user and exam-preparation courses on ICT on a part-time basis.

Nonformal and community education

The Government of Montserrat supports community access to ICT in several ways. The government maintains a free Internet kiosk, outside the Government Information Services Unit in Brades, with additional computers available in the Brades public library, the only public library on the island.

CARICOM has also funded a creation of a video-conferencing center that is open to the public.

EMIS

There is no significant effort at EMIS implementation at this time in Montserrat as a result of high projected cost.

All government systems, however, are networked to Government Headquarters.

Barriers and challenges

- **Technical support:** At present one technician serves the schools. The Government Information Systems Unit provides technical support, maintenance and repairs to all government ICT systems, including those in schools.
- **Lack of support for teachers in schools:** Teachers are trained in the use of ICT. However,

no provisions are made for TPD for technology integration, or teacher networking and collaboration.

- **Sustainability:** At present, recurrent costs of ICT are funded through DFID and the EU.

- **Lack of tertiary programs:** Although UWI Montserrat offers certificate programs, there are no degree-based programs in computer science or engineering available in Montserrat.

Research for this report was conducted by Mary Burns.

St. Kitts and Nevis

Summary

Although the Federation of St. Kitts and Nevis has been involved in educational computing since 1998, most measures have been modest. Students in primary and secondary schools have access to ICT and to instruction in basic computer use; primary students also use educational software to build math and language-arts skills. Computer installations at all levels offer a mixed array of older and more current hardware, complicating maintenance and troubleshooting.

The recently released *National ICT Strategic Plan* (2006), however, proposes a credible and well-structured series of objectives and measures intended to significantly increase the impact of ICT on social and economic conditions. The plan includes a substantial section on education. Funding of education in St. Kitts and Nevis is provided by government and donor agencies; it is unclear the

extent to which current sources of support will fund the proposed measures.

Traditionally based on agricultural production of sugar, the economy of the Federation of St. Kitts



Basic Data

Category	Date	Value
Population	2006	39,129
Per capita GDP (PPP)	2005	\$8,200
Economy, composition agriculture	2005	Tourism, light manufacturing, financial services,
Literacy, total population 15 and over	2003	97.8
Literacy rate (women)	—	NA
Gross enrollment ratio, primary	2002/3	111.8
Gross enrollment ratio, primary (girls)	2002/3	114.9
Net enrollment ratio, secondary	2002/3	94.8
Gross enrollment ratio, secondary (girls)	—	NA
Number of primary schools	2007	24
Number of secondary schools	2007	7
Language of instruction	—	English

Sources: World Factbook, UNESCO, MOE

Relevant Policies

Document	Status	Date	Key points and objectives
National ICT Strategic Plan	Adopted	2006	<ul style="list-style-type: none"> ■ Substantial attention to ICT in education ■ Computer literacy as a first step toward participation in the global information society ■ Subsequent steps accomplished via comprehensive reform of curricula, TPD, EMIS, etc.
ICT Strategy and Action Plan 2002 to 2006	Adopted Modified in 2004	2002	—

Source: MOE

and Nevis has been pushed by the decline of the sugar export market into diversification agriculturally and in sectors such as tourism, light manufacturing and financial services.

These changes notwithstanding, per-capita GDP above US\$8,000 is approximately the mean for OECS countries. Slightly higher labor costs coupled with the graying of the local population, however, have reduced economic competitiveness.

Given these circumstances, education and the increased use of ICT in schools appear to be gaining in importance both within the MOE and among policymakers.

Policy and planning

St. Kitts and Nevis has yet to develop an ICT policy in education. However, the 2006 *National ICT Strategic Plan* includes a significant education section outlining specific actions intended to maximize the contribution of schools to ICT-

related human-resource development. Achieving human-resource development objectives, according to the plan, will require “deep changes in curricula, teaching methods, operation and management of formal and informal educational programs and institutions, provision of teaching and learning materials as well as supporting lifelong learning through a combination of traditional classroom (face to face), distance, and open education methods.”

Strategic objectives include ensuring equitable access, achieving universal computer literacy among school-leavers, empowering teachers to use ICT to support teaching and learning, improving school administration through information management, and increasing communication and stakeholder participation. The *Strategic Plan* emphasizes partnerships between the MOE and other ministries.

In addition to government budget allocations, the *Strategic Plan* details the need for funding from multilateral and bilateral donor organizations, development agencies, and local stakeholders encompassing both businesses and communities.

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools	24	~250	<ul style="list-style-type: none"> ■ All schools have computer labs ■ Labs average 14 computers with Internet connection ■ Primarily used with language arts and math software package
Secondary schools	7	~350	<ul style="list-style-type: none"> ■ All schools have computer labs ■ Labs average 30 computers plus Internet connection ■ Schools on St. Kitts all have broadband connections ■ The majority of schools on Nevis have dial-up connections ■ Lower-secondary has ICT curriculum ■ Upper-secondary prepares for CXC IT exam

Source: MOE

ICT in primary and secondary schools

The introduction of computers into schools in St. Kitts and Nevis began in 1998, primarily in support of student preparation for the CXC IT exam. As of 2007, however, the value of ICT in support of enhanced teaching and learning across the curriculum is receiving new emphasis.

Primary schools

In 2003, the MOE completed a US\$1 million installation of computer labs in primary schools. These facilities are typically used for skill-building exercises delivered via an educational software package addressing language arts and math. The lab-based software is connected to curriculum resources used by teachers in their classrooms.

Low levels of ICT skills common among primary teachers, in combination with limited TPD-focused organizational resources, constitutes a barrier to further integration of computers into teaching and learning across the curriculum.

Secondary schools

The project to install computer labs in secondary schools began in 1998, but encountered a string of challenges that both delayed and compromised completion of the project. All secondary schools have functioning computer labs and Internet connections. Installation among schools on Nevis, however, lagged installation on St. Kitts for a range of reasons, with Internet connectivity most strongly affected. The majority of high schools and primary school on Nevis connect via dial-up at present.

As is common throughout the region, the primary focus of computer use in secondary schools is to prepare upper-secondary students for the CXC IT

exam. Unlike many of the region's education systems, schools in St. Kitts and Nevis also offer an ICT curriculum designed for lower-secondary students. An additional ICT curriculum developed by OERU was pilot tested in secondary schools in the 2005–2006 academic year.

Teacher professional development

Although possibly adequate for the current low level of computer use and integration in schools, both in-service and pre-service TPD systems form barriers to increased use of ICT.

The MOE has conducted no large-scale in-service TPD programs since the installation of computer labs in secondary schools in 1998. School faculties typically include IT teachers, who are responsible for conducting lab sessions, teaching computer literacy, and providing basic maintenance.

The need for local in-service TPD capacity has been recognized by the MOE as a significant barrier to expansion of ICT in education.

Since 2003, the Clarence Fitzroy Brown College has offered a two-year Associate Degree in Education. Computer literacy is included as a requirement for the degree.

Tertiary education

Tertiary institutions serving the populations of St. Kitts and Nevis include the Clarence Fitzroy Bryant College and a UWI school of continuing studies. (Six overseas campuses of foreign universities are also located on the island, with enrollments drawn almost exclusively from international students.) Bryant College provides basic computer services and

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
No in-service programs	—	—	—	—
Brown College, Teacher Education Division	Pre-service teachers	■ Associate of Arts degree, education involves IT training	■ ~40 graduates per year	■ Trained teachers may be recruited by schools in other countries

Source: MOE

instructions, while UWI offers enrolled students access to online course material and to instruction via video teleconference (VTC).

Bryant College, with an enrollment of 500 students, awards associate degrees and includes a Division of Teacher Education and a computer studies program. Graduates of the teacher-education program receive computer literacy training. Bryant College has four computer labs with approximately 60 computers connected to the Internet.

The local UWI SCS offers both contact-based and distance-based instruction to students. Programs of study include post-graduate work in education, with a maximum of six students enrolled at a given time. UWI students in St. Kitts can use a campus computer lab to access UWI course content. However, the majority of students are enrolled in contact-based courses or, through UWIDEC, in courses delivered via VTC.

Nonformal, distance, and open education

At present, three libraries on the islands—in Basseterre, Sandy Point, and Cayon—offer patrons access to computers connected to the Internet.

Funding from the Taiwanese government has enabled the recent construction of an indeterminate number of Community Access Points (CAPs), offering ICT access and training to members of lower-income communities. Per the *National ICT Strategic Plans*, the CAPs will support access to government services online, educational opportunities, work and career opportunities, and other services.

A pilot community-access and ICT training project was conducted in 2001–2002 under the Rural Adult

Education Program. In this project, a school computer lab was opened to community members during non-school hours. Although planning documents and other reports refer to proposed expansion of this program, no progress has been made at the school level.

EMIS

The *National ICT Strategic Plan* strongly emphasizes the need for effective EMIS. However, EMIS has yet to be implemented.

Barriers and challenges

- **Lack of trained teachers:** Present TPD measures are inadequate to achieve the objectives for ICT use and integration outlined in the *National ICT Strategic Plan*. The ICT component in teacher education focuses exclusively on basic computing skills; the MOE has no in-service TPD capacity in ICT.
- **Aging computers and low maintenance capacity:** Installation of computers began in 1998 and has continued. Many of the computers in secondary and, to a lesser extent, primary schools are both old and under-maintained. In addition to being costly to maintain, these older computers do not run newer software or Web applications.
- **Lack of ICT capacity within MOE and private sector:** School faculties include trained IT teachers. Broader human-resource support for ICT in schools, however, faces challenges in terms of limited technical knowledge and experience within the MOE and the private sector. These challenges affect maintenance and support, telecommunications, provision of TPD, procurement, and other activities.

Summary

Although use of ICT among the public and within the government is not high, the MOE is an ICT leader on the island. All secondary schools have computer labs with Internet connections. The MOE has worked with OERU to draft and refine ICT policy documents and to procure and implement EMIS. The resulting policy (not adopted) emphasizes the use of ICT to enhance learning in all curriculum areas. Computer use in primary schools, however, remains low, while focus at the secondary level is on building ICT skills.



Introduction

An end to preferential trade status in the EU in the 1990s led to a significant decrease in banana exports in the 1990s. St. Lucia has strived with some success to offset these reductions by increas-

ing activity in its financial-services and tourism sectors. By several measures, the country and government are achieving a high quality of life relative to economic output: In 2003 St. Lucia was ranked 71st in the UNDP HDI report, 17 places above its rank in terms of per-capita GDP; in the

Basic Data

Category	Date	Value
Population	2006	168,458
Per capita GDP (PPP)	2005	\$4,800
Economy, composition	1996	Financial services, tourism, manufacturing, agriculture
Literacy, total population 15 and over	2001	90.1
Literacy rate (women)		90.6
Gross enrollment ratio, primary	2002/3	104.3
Gross enrollment ratio, primary (girls)	2002/3	103.8
Gross enrollment ratio, secondary	2002/3	89.8
Gross enrollment ratio, secondary (girls)	2002/3	89.7
Number of primary schools	2006	86
Number of secondary schools	18	2006
Language of instruction	—	English

Sources: World Factbook, UNESCO, MOE

Relevant Policies

Document	Status	Date	Key points and objectives
Integration of ICT in education: Proposed policies	Draft, adoption in process (re-working of OERU model, facilitated by consultant Maria Plummer)	2002	<ul style="list-style-type: none"> ■ Harmonize activities, approaches and standards in the use of ICT in education ■ Encourage all education stakeholders to use ICT meaningfully ■ Ensure equitable access to ICT ■ Increase availability of ongoing TPD ■ Ensure frequent upgrading of ICT tools
Draft policy for the integration of ICT in the education system	Draft, not considered for adoption (augmentation of the OERU model policy, facilitated by Mark Ernest of OERU)	2002	<ul style="list-style-type: none"> ■ Objectives similar to the draft in the process of adoption, however in a different sequence

Source: MOE

same report St. Lucia is ranked 40th in school enrollment, again out-performing the economy. Unemployment, however, remains high (as is normal in the region).

Education in St. Lucia is funded by loans and other assistance from the World Bank, CDB, DFID, and UNESCO. Volunteers from the Japanese Overseas Cooperation Volunteers have served as IT specialists providing significant assistance to the MOE.

approval. The draft policy clearly and consistently supports ICT use in schools in order to enhance teaching and learning across the curriculum, and to enable comprehensive reform linking ICT integration to changes in assessment, classroom practice, and learning resources.

(In the process of the adaptation, two St. Lucia policy documents were developed, including one that more closely reflects the OERU model.)

Policy and planning

The Ministry of Education (MOE) of the Government of St. Lucia has been an active partner of the OERU in the areas of ICT-policy development and EMIS implementation. A key participant in OERU's development of a model ICT policy, in 2002 the St. Lucia MOE began a process of adaptation and augmentation of the model document, leading to the development of the draft *Integration of ICT: Proposed policies*.

The draft policy was completed in 2002, and is as of 2007 being adapted to present to the cabinet for

ICT in schools

Some primary and all secondary schools in St. Lucia have received computer labs as donations from C & W.

Maintenance presents problems in both primary and secondary schools. Two private sector companies have been contracted to maintain school computers. In addition, three technicians in the MOE IT unit are also charged with maintaining school computers. Challenges to maintenance include lack of on-site visits by the MOE technicians, compounded by aging hardware. When

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools, government	86	~315	<ul style="list-style-type: none"> ■ 20 schools have labs of 10 computers ■ 512 kbps DSL
Secondary schools, government	18	—	<ul style="list-style-type: none"> ■ All secondary schools have labs of roughly 20 computers ■ EDUNET fiber-based ISDN network

Source: MOE

failures occur, computers must be sent to the MOE IT unit for repair.

As a result of C & W support, some primary and all secondary schools access the Internet through the MOE's EDUNET server. Original primary-school dial-up connections to EDUNET have been replaced by DSL; Secondary schools connect to EDUNET via fiber-based ISDN or T1.

Overall, although the MOE in collaboration with C & W has introduced ICT into primary and secondary schools, the effort remains on the level of an introduction. Limited student access to computers in combination with lack of support for TPD and curriculum development ensures that focus especially in secondary schools remains on the development of basic ICT skills.

Primary schools

The 20 primary schools (out of 86) with labs are connected to the Internet at 512 Kbps. In ten of these schools, computers are three or more years old, and present maintenance challenges. In these schools, it has been estimated that 50 to 75 percent of computers are functional. Ten additional primary schools have received computers more recently, under a poverty-reduction program; a higher proportion of computers in these schools are functioning at present.

(Schools received computers for poverty reduction as a result of applications made to the MOE.)

In 2005, the MOE entered into an agreement with Riverdeep Interactive Learning to adopt the Destination Math software at the primary and secondary levels.

All primary schools have computers for administrative and/or teacher use. In roughly 75 schools, these computers have Internet access; the remaining schools lack telephone lines.

Internet connection rates are adequate (512 kbps via DSL); connectivity is provided at a discounted rate by C & W. However, telephone-line quality is poor, and frequently limits Internet access. Secondary schools

All 18 government secondary schools have computer labs of roughly 20 computers, as part of the C & W donation.

Computer-lab timetables are taken up with elective courses preparing students for the CXC ICT exam. Fifteen to 20 students per class are selected for the IT course based on prior scores in math exams.

A new secondary school, Ciceron, has been developed as a flagship ICT school. In addition to vocational programs, including IT, the Ciceron school will make use of CAI to support its curricula and will offer ICDL and Microsoft certification.

Teacher professional development

Pre-service teacher education takes place under the auspices of the SALCC, which includes a UWI center that offers the B.Ed. degree in primary and secondary education. SALCC features three computer labs for general use, plus two additional labs for technical studies such as CAD. Overall, teacher education lags staffing needs substantially,

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
Sir Arthur Lewis Community College (SALCC)	Pre-service teaching candidates	<ul style="list-style-type: none"> ■ Prepare candidates for profession of teaching ■ All SALCC students have access to computer labs, Internet connections, and ICT training 	—	<ul style="list-style-type: none"> ■ Limited enrollment
MOE quarterly workshops	In-service teachers	<ul style="list-style-type: none"> ■ Build basic ICT skills ■ Build skills in integrating ICT into the curriculum 	—	<ul style="list-style-type: none"> ■ Interest levels are low

Source: MOE

with a majority of schools having faculties with less than 80 percent of teachers trained (as of the 1999–2000 academic year).

In-service teachers may elect to participate in quarterly workshops offered by MOE personnel, addressing basic computing skills, and integration of ICT into the curriculum. These workshops are offered in Castries.

Under an arrangement between the MOE and C&W, teachers are able to purchase computers for home use at reduced prices; they receive six months of Internet connectivity free of charge.

Staffing in schools in relation to ICT remains a challenge. Retention of trained IT teachers is lower than retention of faculty in general; at the same time, many IT teachers are uncertified and lack necessary skills.

Tertiary education

In 1985, SALCC was created via the merger of three existing higher-education institutions. Named after the Nobel prizewinning economist from St. Lucia,¹² SALCC offers associate programs in technical and management studies, agriculture, and health sciences. The program in technical and management studies offers degrees in computer and network maintenance.

The teacher-education program, as mentioned, offers the B.Ed. degree in primary or secondary education through UWI.

The 1,400 students at the campus have access to three computer labs sharing a 1.5 mbps DSL connection to the Internet. Additional labs are available to students requiring CAD capabilities. All students have SALCC email addresses,

Through its Continuing Studies program, SALCC offers a number of evening courses in office-productivity applications and computer maintenance.

Nonformal, distance, and open education

As mentioned, ten St. Lucian primary schools have applied for and received computer labs and Internet connections to support poverty reduction. Students use the labs during the school day; community

members have access to the facilities at night and on weekends.

Training in basic computer skills is provided. Levels of demand among communities are generally high.

The Government of St. Lucia also operates the National Skills Development Center, which helps high- and low-skilled school-leavers and unemployed adults (ages 16 to 65) acquire job skills and information about job opportunities. The general programs of the NSDC include computer literacy. Technical/vocational courses include: electrical installation, dressmaking and fashion design, drapery, floral arranging, cake decorating, catering, and IT.

EMIS and MOE ICT capacity

After several years of experimentation and unforeseen delay, the MOE is in the process of implementing an EMIS.

In 1999 and 2000, St. Lucia served as the pilot site for the OERU effort to develop, test, and disseminate an EMIS that would be “harmonized” for use in all OECS countries. Problems arose both with the software and with the implementation plan. Société GRICS, a non-profit organization run by the Quebec school system, developed the GPI school-management software. Customization was incomplete at the time of installation: drop-down help instructions, for example, remained in French. In addition, school staffs were asked to attend training and to enter and maintain all relevant records, but were not released from other responsibilities. Participation did not reach high levels. Additional problems arose related to network infrastructure and compatibility with in-school server software. In part as a result of these challenges, the OERU EMIS project stalled.

The MOE has pilot tested an EMIS product independently. School administration software developed by Maplewood Computing Ltd., of Vancouver, BC, Canada, was selected for pilot testing in 10 schools.

(For additional information, see the section, “EMIS implementation in the Caribbean.”)

¹² St. Lucia was also the birthplace of the 1992 Nobel laureate in literature, Derek Walcott. Sir Arthur Lewis was awarded the prize in economics in 1979 for his studies of trade and labor productivity among developed and developing nations.

Barriers and challenges

- **Minimal student access to computer:** In secondary schools, use is generally restricted to the students who qualify for the IT elective based on their math scores. Timetabling for IT classes occupies all or almost all of the available lab hours, barring teachers—even those who have received ICT-integration training—from integrating computers into students' study of other subjects.
- **Teachers are unenthusiastic:** Teachers are not engaged in the process of using ICT. TPD is available through the MOE, but teachers remain resistant.
- **Maintenance is inadequate:** Maintenance is neither timely nor convenient, despite the fact that the MOE has engaged the services of two private sector computer-maintenance firms and has mandated that its IT unit also support school computers. Repairs are made *ad hoc* and off-site; there are no regular, on-site maintenance activities.
- **Lack of understanding ICT integration among MOE personnel:** For many MOE personnel, ICT in schools should support basic-computing courses and IT electives. When integration is considered, solutions such as subject-specific software (i.e., Riverdeep's Destination Math) or CAI-based products are considered, while the potential of productivity software, collaboration tools, and the World Wide Web is neglected.
- **Inadequate knowledge of trends in ICT in education:** For St. Lucia, with a systemwide commitment to ICT use in schools, trends in hardware, networking, and learning-resource development could yield significant returns, yet these trends are largely ignored. Thin-client networks and open-source software, for example, could help the MOE address limitations on computer access by increasing the amount of computing power and the number of workstations available at a given price.

A portion of the research for this report was conducted by Dr. Clarisse Lima.



St. Vincent and the Grenadines

Summary

In 2002, all secondary and 25 percent of primary schools in St. Vincent and the Grenadines received computer labs supporting IT exam preparation and basic computer skills. These installations are currently in need of significant maintenance.

ICT policy in education is well developed, and complements significant policy and planning efforts in economic development, telecommunications, and other sectors. Capacity within the Ministry of Education, Youth, and Sports (MOEYS) to achieve policy goals must be developed—a need that is clearly recognized within the ministry itself.

The country of St. Vincent and the Grenadines faces an array of emerging economic challenges. These include effects of globalization, such as out-migration of skilled labor and increased agricultural competition in export markets, as well as challenges historically common to SIDS, such as vulnerability

to climate events and to fluctuations in the global economy. Export agriculture, notably crops such as bananas and arrowroot that were previous mainstays of the economy, has declined, with impact of this decline felt most among the rural poor. Although recent growth rates have increased, the country remains among the poorer in the Caribbean in



Basic Data

Category	Date	Value
Population	2006	117,848
Per capita GDP (PPP)	2005	\$3,600
Economy, composition	2005	Tourism, light manufacturing, financial services, agriculture
Literacy, total population 15 and over	1970	96
Literacy rate (women)	1970	96
Gross enrollment ratio, primary	2002/3	107.3
Gross enrollment ratio, primary (girls)	2002/3	105.9
Gross enrollment ratio, secondary	2002/3	69.2
Gross enrollment ratio, secondary (girls)	2002/3	72.7
Number of primary schools	2006	61
Number of secondary schools	2006	26
Language of instruction	—	English

Sources: World Factbook, UNESCO, MOE

Relevant Policies

Document	Status	Date	Key points and objectives
National Policy on the Use of ICT in Education	Draft	2004	■ Emphasis on ICT to support learner-centered activities, per OERU policy template
National Training Plans for TVET	—	—	—
Education Sector Development Plan	Adopted	2002	■ Sets goals and vision, not focused on ICT
ICT Strategy and Action Plan 2002 to 2006	Adopted Modified in 2004	2002	■ National plan, not specific to education

Source: MOEYS

terms of per-capita GDP, with 38 percent of the population living below the national poverty line.

Implementation of ICT in schools remains in its early stages. However, with support from international and bi-lateral donors, St. Vincent has embarked on a comprehensive economic-development program keyed by a PRSP and related planning and policy documents emphasizing adoption of ICT. Recent milestones include the achievement of universal secondary education. Principal donors include the EU, CDB, DfID, Taiwan, and the World Bank.

ICT policy in education, drawing from the OERU policy template, emphasizes the use of ICT to enhance education quality by facilitating learner-centered pedagogical practices. In fiscal 2007, the Government of St. Vincent allocated 22 percent of its recurrent and 20 percent of its capital expenditures to education, with the latter earmarked primarily for the construction and upgrading of schools.

Policy and planning

St. Vincent benefits from a comprehensive set of policy and planning documents relative to the country's population and the complexity of its economy. (This may in part be a result of substantial donor involvement in several sectors of the economy and government.)

The most recent and relevant policies, such as the *National Policy on the Use of ICT in Education* and the *National Training Plan for Technical and Vocational Education and Training*, emphasize

development of high-demand job skills. In emphasizing problem solving, communication, and other skills in conjunction with computer skills these plans align with broader plans and policies, such as the *ICT Strategy and Action Plan*.

Implementation, however, currently lags planning; effective influence of policy on ICT use in schools has yet to be felt.

ICT in primary and secondary Schools

With funding from Taiwan, all secondary schools and 25 percent of primary schools received computer labs in 2002. These facilities primarily support CXC IT exam preparation and basic computer studies. All schools have IT specialists on staff.

To a greater extent than is common in the region, the need to overcome barriers to maintenance of existing installations has become critical, with respondents suggesting that no more than 40 percent of installed hardware is functioning. Additional funding for maintenance has been requested, with maintenance to be provided by a unit in the Ministry of Telecommunications, Science & Technology.

Primary schools

Although still in the planning phase, MOEYS has prioritized movement toward goals that are cognate with the *National Policy on the Use of ICT in Education*, notably the use of ICT to enhance student learning in language arts and science and to support PBL.

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools	61	~150	<ul style="list-style-type: none"> ■ 15 schools have computer labs ■ 30 computers, one server, one printer per lab ■ Used mainly for computer literacy
Secondary schools (includes vocational)	26	~250	<ul style="list-style-type: none"> ■ 26 schools have computer labs ■ 30 computers, one server, one printer per lab ■ Used mainly for CXC IT exam preparation

Source: MOEYS

Secondary schools

Plans for secondary schools include ICT access across the curriculum, with computers and the Internet supporting demonstrations by teachers and classroom use by students in all disciplines.

Bequia High School community multimedia center

In July 2007 the high school on the island of Bequia, the northernmost of the Grenadine islands, began broadcasting radio programming developed at its Community Media Center (CMC). Students and teachers at Bequia High School, having received training in multimedia skills including Internet use, interviewing techniques and scripting of radio content, sound editing, and other skills develop the programming, which is intended at least in part to support community development. Teachers have also received TPD enabling them to integrate information-literacy education into school curricula. The Bequia High School CMC has emerged from a partnership among the high school, UNESCO, and the St. Vincent and the Grenadines National Commission for UNESCO.

In partnership with UNESCO, Bequia High School will support the CMC-based broadcast

Teacher professional development

TPD has been roughly commensurate with ICT implementation in schools. Teachers have been trained through a variety of programs, however additional training, including training in educational uses of computers and the Internet, is required.

Among the barriers to effective TPD, as noted by respondents, is teachers' disinterest in the use of ICT in relation to both classroom activities and administrative tasks. (This lack of interest may, however, be reflective of lack of access and capacity.)

Plans for increased support for learner-centered pedagogy, noted in the previous section, also call for linking ICT use to curriculum reform and new TPD initiatives.

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
MOEYS in-service training—2002 (supported by Taiwan)	In-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Help teachers build basic computer skills 	<ul style="list-style-type: none"> ■ 500 teachers overall 	<ul style="list-style-type: none"> ■ Teachers lack interest in computer use in schools
MOEYS training of IT specialists	In-service teachers selected as IT specialists	<ul style="list-style-type: none"> ■ Provide skilled support on-site in each school 	<ul style="list-style-type: none"> ■ 45 teachers 	<ul style="list-style-type: none"> ■ Training and support for maintenance functions is inadequate
MOEYS additional training—intermittent, ongoing	In-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Help teachers build basic computer skills 	<ul style="list-style-type: none"> ■ Not known 	<ul style="list-style-type: none"> ■ Teachers lack interest in computer use in schools

Source: MOEYS

Tertiary education

Establishment of the St. Vincent and the Grenadines Community College (SVGCC) was authorized in 2005. Computer facilities are located at the central Villa Arts & Science Campus of SVGCC, and in 2005 comprised 70 computers divided between the department of Computer Science and the Information Resources Center. Internet connectivity at a bandwidth of 512 Kbps is shared among these computers and among any computers used by faculty or administrators.

At the time of the 2005 assessment, student access was limited to 17 computers as a result of inadequate electrical power and limited IT management capacity.

EC funding has been requested to improve the ICT facilities at SVGCC.

UWIDEC also maintains a distance education center on St. Vincent.

Nonformal education

As part of its effort to upgrade workforce skills and support community development, the Government of St. Vincent has established Learning Resource Centers (LRCs) in each of the country's precincts. The goal of the LRC program is to afford all St. Vincent citizens with access to ICT and to effective training.

EMIS and ICT capacity within MOEYS

MOEYS has identified EMIS as a priority. However, capacity within the ministry is not adequate for procurement and implementation of complex solutions on a systemwide basis. Lack of technical skills in schools forms a second, equally significant, barrier.

Barriers and challenges

- **Significant gap between policy and practice:** Gaps between policy and practice create pressure for ambitious—as opposed to incremental—projects that may be beyond the capacity of the MOEYS and other implementing organizations. To meet the goals outlined by current policy, ICT use must be coupled with comprehensive changes in curricula, TPD, and assessment. Such changes cannot be accomplished within the shorter horizons of most political or budgetary cycles.
- **Limited capacity within MOEYS in relation to project plans:** The gap between current practice, in which basic computer skills are emphasized, and policy goals that focus on ICT integration in the service of the development of a twenty-first century workforce, reflects the limited experience within the MOEYS in relation to effective ICT implementation. Planning of incremental change and procurement of competent technical assistance are critical if the MOEYS is to avoid duplicating the failures of high-profile projects within the region.
- **Installed systems require high levels of maintenance:** Capacity within MOEYS to maintain systems currently installed is inadequate. The high proportion of non-functional computers limits existing programs that are focused on helping students build basic computing skills, and renders plans for increased ICT support of student-centered teaching and learning moot. Proposed collaboration with the Ministry of Telecommunications, Science and Technology may help alleviate this problem.

Trinidad and Tobago

Summary

The Trinidad and Tobago education system has a long history using and experimenting with ICT in schools. That history notwithstanding, current levels of ICT access and use are inadequate. The FastForward project, the Secondary Education Modernization Program (SEMP), and other initiatives currently in process are intended to radically improve both the quality of teaching and learning in schools and access to ICT for teachers and students.

The standard of living in Trinidad and Tobago is among the highest in the Caribbean. The Trinidadian economy has historically depended on exports of oil and natural gas, other petrochemicals, and asphalt. Economic planning has begun to

emphasize tourism, although to a lesser extent than many neighboring island states.



Basic Data

Category	Date	Value
Population	2006	\$1,065,842
Per capita GDP (PPP)	2006	\$16,800 (2005 est.)
Economy, composition	2006	Oil and natural gas, asphalt, tourism
Literacy, total population 15 and over	2003	98.6
Literacy rate (women)	2003	98
Net enrollment ratio, primary	2000	98.4
Net enrollment ratio, primary (girls)	2000	100
Gross enrollment ratio, secondary	2000	70.7
Gross enrollment ratio, secondary (girls)	2000	70.3
Number of govt. primary schools*	2002/3	481
Number of govt. secondary schools	2002/3	132
Language of instruction	—	English

* The categories "govt. primary schools" and "govt. secondary schools" include both government schools and government-assisted schools. Government-assisted schools are public schools operated and partly financed by the state but owned and managed by private bodies, usually religious organizations of various denominations. The Trinidad and Tobago education system also has 63 private primary schools and 66 private secondary schools.

Sources: World Factbook, UNESCO, MOE

Relevant Policies

Document	Status	Date	Key points
FastForward: National ICT Plan 2003–2008 (part of the national <i>Vision 2020</i> development plan)	Adopted	2003	<ul style="list-style-type: none"> ■ Connect people, communities, businesses, government, and educational institutions ■ Increased competition in the IT sector ■ Improved ICT standards and accessibility ■ All schools connected via high-speed Internet by 2008

Source: MOE

Policy and planning

The FastForward plan has led as planned to increased competition in the telecommunications sector, including two new mobile-telephone competitors complementing competition among ISPs and in the Cable TV (CATV) market. FastForward calls for initiatives to support ICT in all levels of formal education and in the establishment or improvement of Community Information Centers (CICs) with all schools fully equipped by 2008.

Also, in response to *Vision 2020*, in 2006 the Ministry of Public Administration issued a number of “policy and procedural guidelines” for ICT-related topics, such as e-mail and Internet usage, and e-government portal development.

Note that the MOE has received funding from the World Bank to support education, but that ICT are not funded. A 2006 IDB grant of US\$67,000 was matched by US\$45,000 from the government to jumpstart development of the country’s IT sector by increasing capacity in software development.

ICT in primary and secondary Schools

The Trinidad and Tobago education system has a long history in relation to the use of ICT in schools. Despite that history, current levels of ICT access and use are not adequate. Plans are in place, however, to significantly improve both access to ICT and the way that computers and the Internet are used in schools.

In 1984, the National Institute of Higher Education placed 4 Macintosh computers in 35 secondary schools. (Note that 1984 was the year that the Macintosh product line was launched.) This program sparked interest, leading schools to buy additional PCs, primarily IBM clones.

In 1998, oilfield-development leases tied to corporate social responsibility activities presented the MOE with an opportunity to provide more schools with ICT. AMOCO contributed over 40 schools with 10 computers each.

About 1999, the MOE purchased 720 additional computers for primary schools, with 46 schools receiving labs equipped with ten computers, a server,

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools, govt. government	481	283 (2002/3)	<ul style="list-style-type: none"> ■ Roughly 80 schools have received 10-computer labs; many computers are no longer functioning
Secondary schools, govt.	132	817 (2002/3)	<ul style="list-style-type: none"> ■ 2006–2007 installation of 34-computer labs, networks, computers on carts, and administrative computers in all schools

Source: MOE

and Classworks software addressing reading and math. With minimal technical support and TPD, the value returned by these and other previously installed computers was limited. In addition, the small (10–15 computer) labs enabled levels of use that were insufficient to achieve impact.

Also in 1999, a US\$100 million loan to the Government of Trinidad and Tobago was approved by IDB for SEMP. This comprehensive program addresses:

- Improvement of the quality of education through measures addressing the curriculum, teaching and learning strategies, TPD and other elements
- Increased equity in education through construction of new secondary schools and upgrades to existing school facilities
- Strengthening of the capacity of educational institutions
- Studies and other measures to improved sector performance

Under SEMP, an operational plan was developed to install computer labs in every secondary school to support IT education and enhanced learning in other subjects. Conversion of school libraries to multimedia learning centers offering students open access to computers and the Internet was planned. However, progress in implementation of the ICT-specific portion of SEMP has been slow, with many limiting factors in common with other large-scale projects described in the Survey.

Primary schools

Approximately 80 of the 450 primary schools have received computer labs under government programs supported by the oil companies CONOCO and Shell as part of their CSR efforts. Of these 2,300 computers distributed between 1998 and 2001, roughly half are no longer functional as a result of age and maintenance challenges.

Under the FastForward initiative, programs are in place in 2006–2007 for distribution of 7,000 computers to primary schools, ensuring that all schools have up-to-date equipment.

Primary schools will be provided with Classwork Gold, a CAI product, supporting math and language arts. Classwork Gold offers opportunities for self-paced learning accompanied by diagnostic

assessments and remediation. Initial implementation targeted one school in each of the Trinidad and Tobago's eight school districts; all teachers in those schools were expected to participate in a four-day training intensive.

Secondary schools

Under the FastForward initiative, all government secondary schools receive labs of 34 computers each, supplemented by computers on carts and wireless connections for use in classrooms. Current and planned Internet connections are via ADSL, with some schools still connected via dial-up. Review of broadband connectivity requirements in relation to planned educational activities (e.g., video conferencing) may be in order.

An estimated half of secondary teachers have ICT skills. Between 1998 and 2001, the MOE provided training to approximately 3,000 teachers; many teachers have acquired computers for home use through a government subsidy started in 1998. Partly as a result of demand for lab-time by ICT classes, teachers with well-developed basic computer skills lack both training in and opportunity for integration of technology into their teaching practices.

Teacher professional development

Teacher training to support the FastForward agenda is provided by the University of Trinidad and Tobago, which offers all in-service teachers the opportunity to participate in a four-year, part-time ICT professional development program. The incentive for participation is the potential for significant increase in salary, in combination with free tuition offered to all government personnel via the Government Assistance for Tuition Expenses (GATE) program.

From 2002 to 2004 the OAS sponsored a program to train primary teachers to develop and integrate e-content through a program implemented by the National Institute of Higher Education, Science and Technology (NIHEST), which also trained teachers in Antigua, Belize, Guyana, and Jamaica. Fifteen to 20 teachers were trained to use technology in the classroom and to use Macromedia software to develop multimedia learning resources. An additional 300 teachers were trained with support

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
Community College courses	In-service primary and secondary teachers	<ul style="list-style-type: none"> ■ Familiarize teachers with ICT 	<ul style="list-style-type: none"> ■ Open to all teachers 	<ul style="list-style-type: none"> ■ No incentives ■ Few teachers have completed course
Microsoft Partners in Learning	In-service primary teachers	<ul style="list-style-type: none"> ■ Provide teachers with basic IT skills ■ Train teachers to integrate technology into their regular curricula 	<ul style="list-style-type: none"> ■ Two teachers per schools ■ Cascade model deployed when those teachers train others 	<ul style="list-style-type: none"> ■ 16,000 teachers currently in service ■ Progress is slow, the number of teachers trained is small ■ Curriculum integration remains elusive
NIHEST	Regional In-service primary teachers	<ul style="list-style-type: none"> ■ Train teachers to use ICT in their classrooms ■ Train teachers to use Macro-media software to develop learning resources 	<ul style="list-style-type: none"> ■ 20 teachers ■ 300 additional teachers received similar training from MOE 	<ul style="list-style-type: none"> ■ Lack of multimedia tools (e.g., digital cameras) in schools

Sources: MOE, The Natoma Group

from the MOE. However, the impact of this project was limited by the absence of tools—including digital cameras, multimedia projectors, and Internet connectivity—that were crucial for continuation of skills gained via training.

Tertiary education

UWI offers administrative support and resources via the Internet, including email addresses for staff, and a student portal for the contact-based St. Augustine campus that allows students to manage their profiles, access email accounts, and perform other administrative functions. A limited number of courses are supported by e-learning delivered via WebCT (an integrated learning package for higher education). As of 2006, students can also use the portal to access electronic editions of journals and other publications to which the university library subscribes.

UWIDEC operates six campuses in Trinidad and Tobago. These campuses offer online admissions (via email and downloadable forms).

The recently organized University of Trinidad and Tobago offers a small array of full- and part-time undergraduate and graduate programs targeting development of capacity in industrial arts and sciences, and related fields including education. Applications and information are available online.

Nonformal, distance, and open education

As mentioned previously, FastForward calls for the creation of CICs to support both formal and non-formal learning as well as access to government services and other resources. The CICs and the overall development of Internet access in Trinidad and Tobago will be complemented by several other initiatives that remain in the planning stages:

- LibraryNet will offer access to catalogs, downloadable resources, and other information.
- Skills and Knowledge for the Information Era (SKIE) will offer training and job creation in the technology sector for young adults
- Student Connections will engage new college graduates in supporting the CICs and the development of e-businesses

The MOE is also planning a national open school. Open School Trinidad and Tobago will provide youth and adult school-leavers with enhanced educational opportunities, including the ability to gain essential ICT skills.

EMIS

The MOE has started planning and procurement processes for EMIS. However, the timeline for these processes is not known.

Barriers and challenges

- **Teacher attitudes toward ICT are not positive:** Teachers are not engaged in the process of ICT implementation in schools. Given the vision of comprehensive and systemwide use of ICT for learning, this situation must be addressed directly.
- **Technical capacity in the MOE may be inadequate:** Respondents stated resource allocation to the MOE's IT unit is too low, limiting TPD opportunities, development of curricula and resources, and knowledge sharing. As a result, respondents suggested that TPD should focus on the ability to make good use of less powerful computer hardware and software.
- **IT curricula may limit use of ICT for FastForward activities:** In many schools secondary-school teachers of computer science and IT, in particular, may replace out-dated hardware and software rather than allowing incoming resources to be used by teachers and students in other subjects.
- **The FastForward program is not supported by curriculum or assessment:** Development or introduction of learning resources mapped to existing curriculum has yet to progress—teachers may find that mobile computers and data projec-

tors are potentially important resources limited by lack of relevant content. Allocating resources directly to schools to create curriculum teams or resource teachers may be one way of addressing this challenge.

- **Maintenance remains an issue:** Service contracts and warranties are inadequate for computers' and networks' day-to-day requirements. Plans have been made for district-level IT units, but these plans have yet to be implemented.

Lessons learned

- **Address maintenance and repairs during planning and procurement:** The first purchase contract entered into by MOE (2000–2002) did not include provisions for service or installation. As noted previously, roughly half of the computers installed in schools prior to 2006 are no longer functional.
- **Individual schools should plan their use of ICT:** Schools are now strongly encouraged to develop IT plans prior to receiving new hardware. Planning committees comprised of all five department heads and led by the deputy principal are intended in part to offset the practical and political strengths of head IT teachers.



Turks and Caicos Islands

Summary

Although the Turks and Caicos Islands remain a British overseas territory, the central government is the sole major funder of ICT projects in schools. Government primary and secondary schools provide access to ICT to students, although that access is limited. Major challenges to greater use and increased effectiveness of ICT in both primary and secondary schools include maintenance and teacher capacity.

The Turks and Caicos Islands are an archipelago consisting of six islands. The capital, Grand Turk Island, and the island of Providenciales have relatively stable economies with adequate growth. Principle sectors are tourism, offshore financial services, and fishing. Other islands are not economically self-sustaining and are at lesser stages, overall, of development.



Policy and planning

Approved in April 2005, the current education policy directly addresses the use of ICT in education.

Basic Data

Category	Date	Value
Population	2006	32,200
Per capita GDP (PPP)	2006	\$16,054
Economy, composition	2006	Tourism, financial services, fishing
Literacy, total population 15 and over	1970	99
Literacy rate (girls)	1970	98
Net enrollment ratio, primary	2002	73.5
Net enrollment ratio, primary (girls)	2002	72.7
Net enrollment ratio, secondary	2002	79.1
Net enrollment ratio, secondary (girls)	2002	79.9
Number of primary schools	2006	31
Number of secondary schools	2006	8
Language of instruction	—	English

Sources: World Factbook, UNESCO, Min. of Education, Youth, Sports & Culture

Relevant Policies

Document	Status	Date	Key points
Current Education Policy	Adopted	April 2005	<ul style="list-style-type: none"> ■ Integrate computer-assisted reading software into instruction at all schools
Development Plan of 1998–2004	Adopted	1999	<ul style="list-style-type: none"> ■ Create a more skilled islander through development of capacity in ICT ■ Provide ICT training to at least one teacher in each school ■ Introduce computer-assisted learning in all schools ■ Install computer hardware and software in all schools
Education Plan of 2006–2010	Completed	November 2006	<ul style="list-style-type: none"> ■ Recognizes the need for greater use of ICT in schools and training of teachers in this area.

Source: MOE

In primary schools, the policy identifies ongoing integration of computer-aided reading programs as a key goal. The Education Plan of 2006–2010 builds off the prior plan of 1999–2004, which lists as objectives: training of at least one teacher per school in computer literacy; the introduction of computer-assisted learning in all primary schools; and, the installation of computer hardware and software.

ICT in primary and secondary schools

Public primary and secondary schools offer students access to computers and the Internet, although the numbers of available computers are low relative to enrollment. A primary-level ICT curriculum

encompasses both basic computer skills (i.e., productivity software) and intermediate skills (i.e., communication, research, graphics). The main purpose of the primary curriculum is to help students prepare for the secondary-level CXC ICT exam.

Private primary schools serving expatriates from Haiti and other economically challenged countries in the region generally do not offer ICT access to students. These schools serve a large proportion of the school-age population, presenting challenges both in terms of equity and in terms of “mainstreaming” disadvantaged students.

Inadequate technical capacity—notably in the area of EMIS—highlight the ways in which the organizational structure of the MOE limits the ability to address barriers ranging from the technical to the

ICT Resources in Schools

School type	Number	Gross enrollment*	ICT profile
Primary schools, government (in 2006/7)	10	1,998	<ul style="list-style-type: none"> ■ 3 computers per schools average, in 2002 ■ 160 computers total, with Internet, as of 2006** ■ Planned introduction of Destination Reading program in all govt. schools; cost is \$120,000 in 2006/7
Primary schools, private	21	1,770	<ul style="list-style-type: none"> ■ 64 computers, total ■ 40 of 64 computers at three schools
Secondary schools, government	4	1,436 (in 2006/7)	<ul style="list-style-type: none"> ■ 52 computers per school, ADSL Internet access
Secondary schools, private	4	409	<ul style="list-style-type: none"> ■ 58 computers total ■ 32 of 58 computers at one school

* The Turks and Caicos Islands include six inhabited islands. School populations vary from island to island sufficiently that an average figure for enrollment is a meaningless distortion.

** In this instance as well, a median figure would be distorting. Salt Cay's one government school has eight students and an estimated two computers (4:1 student-computer ratio). A school on Providenciales has a 430-student enrollment and 26 computers (16:1 student-computer ratio).

Source: MOE

pedagogical. A Computer Unit is responsible for support of all Ministry technology initiatives. However, the Computer Unit is technology-focused, and does not have pedagogical or school-operational expertise.

Funding for education in Turks and Caicos Islands is currently limited to inputs from the central government; no donor-funded ICT projects have taken place.

In primary schools, students in grades 4 through 6 are required to complete ICT curricula. These curricula emphasize not only use of office productivity tools, but also the use of information, communication skills, and graphics tools.

Although a few private schools serve middle- or upper-class catchments, the remainder of the more than 21 private primary schools serve expatriate communities from the Dominican Republic and Haiti that are disadvantaged both by language (e.g., Spanish and French) and income. These schools rarely offer functioning computers or Internet connectivity, even though ADSL connectivity is available free of charge by arrangement with C & W. If the government is successful in implementing the proposed computer-assisted reading program, Destination Reading, in government schools, students in the private primary schools will not benefit. Estimated cost of introducing Destination Reading is US\$120,000, which includes both software licensing and costs of additional hardware.

Both public and private primary and secondary schools in the smaller, outlying islands perform at lower levels than their peers on Grand Turk and Providenciales Islands, possibly because there is less incentive for and less daily emphasis on academic success. In relation to ICT, students on the smaller

islands will have more limited access to ICT outside of schools—whether at home, in libraries, or at cybercafés. (With specific reference to cybercafés, parents in outlying islands may see less benefit to paying for use of computers or the Internet.)

Secondary schools

The primary curriculum prepares students for a secondary ICT curriculum offered in forms 4 and 5. The secondary curriculum conforms to the CXC syllabus and prepares students for the CXC IT exam. In the 2005/2006 school year, out of approximately 254 Form 5 students attending government schools, 138 participated in the CXC IT exam. Of these, 87 received passing scores. Students sat for the General Certificate of Education (GCE) or International General Certificate of Education (IGCSE) exams) at one private school, with 19 of the school's 20 fifth-form students participating and 13 of 19 passing.

Teacher professional development

Because TCI teachers do not elect to participate in the community-college-based ICT certificate program, awareness and capacity among faculty island-wide is minimal. This situation also reflects the fact that private sector marketing and support for ICT use among the public is a relatively recent phenomenon. The primary and secondary IT curricula are typically taught by expatriate teachers who have received appropriate certificates or degrees off-island.

There are no current plans that address integration of ICT into other areas of the curriculum. Barriers include the overall lack of awareness among the

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
Community College	In-service primary and secondary teachers	Familiarize teachers with ICT	Open to all teachers	<ul style="list-style-type: none"> ■ No incentives ■ Some teachers live on islands without community colleges; available time is only weekends and holidays ■ Few teachers have completed course

Source: MOE

public and among teachers, and—according to one respondent—lack of basic skills among students and possible lack of subject mastery among teachers.

Relevant (e.g., Caribbean) evaluation results demonstrating impact of ICT used to help students build basic skills and support teachers' development of subject mastery would be useful as a means of demonstrating applicability of ICT to current challenges in the education system.

Tertiary education

The TCI community college offers several programs that address ICT, ranging from certificates in computer applications, database management, and autoCAD to Associate Degrees in Electrical Engineering. In addition, use of CAD/CAM (Computer-aided design/Computer-aided manufacturing) software is addressed in technical-drawing classes.

There has been discussion within the government of extending access to the community college using ICT. Access to the community college, located on Grand Turk Island with a branch on Providenciales, may be problematic for residents of North Caicos, South Caicos, Middle Caicos, and Salt Cay islands. Students on these smaller, outlying islands must relocate to attend the community college.

EMIS

Steps have been taken to implement EMIS across the Turks and Caicos Islands schools: computers have been purchased; software was developed locally and has been installed in a few schools. However, network infrastructure problems have stalled the project. Adequate school-wide implementation would require a systemwide LAN, whether wireless or wired. In addition, development of a central database that can be accessed by all users at all times has proved problematic.

EMIS implementation requires the extension of technical support beyond the current boundaries of the Ministry's administrative structure to the level of the schools themselves.

Non-formal and community ICT education

The Department of Social Development operates two community centers addressing the needs of out-of-school youth. However, these centers presently do not provide access to ICT.

Barriers and challenges

- **Uneven economic development among islands:** Disparities in economic development among islands contribute to differences in the quality of education, with poorer students, schools and communities at a disadvantage, and to unequal access to ICT.
- **Large proportion of students in private schools:** Approximately 45 percent of primary students and 22 percent of secondary students attend primary schools. The majority of these schools offer much lower levels of ICT access than do government schools. Students entering secondary schools from private primary schools will lag students attending government schools in terms of ICT skills. Students attending private secondary schools will likely remain disadvantaged in this regard. In both instances, a large cohort of the student population lacks equal opportunity to prepare for and pass the CXC IT exam.
- **Teachers lack ICT skills and incentives to participate in TPD:** As mentioned, the island topography of the Turks and Caicos Islands creates barriers to teacher access to community-college ICT courses. Motivation, however, is a problem for many teachers regardless of their location: the current TPD program does not establish incentives for teachers' participation in ICT-focused TPD.
- **Technology unit of MOE lacks capacity and mandate:** As currently structured, the technology unit within the MOE is neither mandated nor resourced to address schools' needs for maintenance, training, curriculum, and other components supporting effective ICT use.

United States Virgin Islands

Summary

Use of ICT in education in the US Virgin Islands focuses on integrating technology into the curriculum and on support for teaching and learning more concretely than is the case in many other countries in the region. Investment has been made in resources such as digital whiteboards, VTC facilities, and curriculum-focused video, in addition to support for computers and the Internet.

The main tertiary institution, University of the Virgin Islands (UVI), offers e-learning courses, as well as VTC-delivered DE connecting its two campuses to each other and to courses from overseas universities and other institutions.

Equitable access appears to be an entrenched challenge for Virgin Islands schools: all schools

have broadband Internet connections, all secondary schools and most primary schools have at least one computer lab; student access, however, varies among schools and does not yet support the levels



Basic Data

Category	Date	Value
Population	2006	108,605
Per capita GDP (PPP)	2004	\$14,500
Economy, composition	2003	Tourism, petroleum refining, textiles, pharmaceuticals, watch assembly
Literacy, total population 15 and over	2005	90–95%
Literacy rate (women)	—	NA
Gross enrollment ratio, primary	—	NA
Gross enrollment ratio, primary (girls)	—	NA
Gross enrollment ratio, secondary	—	NA
Gross enrollment ratio, secondary (girls)	—	NA
Number of primary schools	2006	24
Number of junior secondary schools	2006	5
Number of secondary schools	2006	5
Language of instruction	—	English

Sources: World Factbook, Virgin Islands Department of Education

Relevant Policies

Document	Status	Date	Key points
Strategic Plan: 2006–2007 to 2010–2011	Adopted	2007	<ul style="list-style-type: none"> ■ Develop technology standards and measure student proficiency ■ Evaluate integration of technology in instruction ■ Improve student achievement by integrating technology within disciplines
U.S. Virgin Islands Department of Education Two-Year Technology Plan	Adopted	2004 (extended through 2006–2007)	<ul style="list-style-type: none"> ■ Two-year plan funded by USED
Internet Use Policy	Adopted	2004	<ul style="list-style-type: none"> ■ Protect students from inappropriate content ■ Seek parents' permission for use of student information and school-related works ■ Provide USED email accounts and websites to employees
U.S. Virgin Islands Department of Education Information Technology Policy	Adopted	2000	<ul style="list-style-type: none"> ■ Outlines privacy, personal use, government access, security and other aspects of ICT use within the DOE

Source: VIDE

of ICT integration that is outlined in policy and planning documents. Even at these moderate levels of ICT implementation, lack of technical-support personnel limits both the overall impact of ICT and the capacity of the school system to increase its ICT use.

Tourism contributes 80 percent of GDP to the economy of the US Virgin Islands, which has been a territory of the United States since 1917. The manufacturing sector, which includes the world's largest oil refinery, contributes an additional 19 percent.

ICT-related planning and implementation in education are strongly influenced by the United States Department of Education (USED), and by the Federal Communication Commission (FCC). ICT in schools is relatively well realized, with systemwide email accounts for teachers, websites for schools, Web support for parents and students, and monthly TPD for IT teachers. All high schools have computer labs and broadband Internet access. All primary and secondary schools have infrastructure for VTC, and most primary schools have computer labs.

Technology integration remains challenging, as does technical support and maintenance. Equity issues are also significant, with Central High School on St. Croix having seven (or possibly eight) computer labs, while other schools do not have equivalent levels of infrastructure.

Funding for ICT in education is received from the Government of the United States in response to the Virgin Islands Department of Education's (VIDE's) two-year technology plans.

Policy and planning

Planning processes in the Virgin Islands are well developed, relative to other countries in the region, in part due to requirements and support derived from the USED. The recently adopted five-year strategic plan is not solely concerned with ICT. Nonetheless, it outlines positions on ICT use, provision of appropriate facilities and resources, and integration of technology within all academic disciplines.

The FCC provides 90 percent of education-technology funding, with the remaining 10 percent provided by the territorial government. Funding is awarded in response to two-year education-technology plans, developed in consultation with teachers, that request additional support for ICT in classrooms, such as wireless networking to support laptops and computers on carts. Because the most recent two-year plan was funded at a level much lower than requested—and because the plan proposes initiatives that address both demand and need in schools—it has been extended for two more years. Additional funding has been received for its implementation.

ICT Resources in Schools

School type	Number	Median enrollment	ICT profile
Primary schools	24	—	<ul style="list-style-type: none"> ■ All schools have at least one computer (admin) ■ Most schools have computer labs with broadband Internet connections
Junior secondary schools	5	—	<ul style="list-style-type: none"> ■ Most schools have computer labs with broadband Internet connections
Senior secondary schools	5	—	<ul style="list-style-type: none"> ■ Most schools have computer labs and broadband Internet connections ■ Several schools have more than one lab (up to 8 labs at Central H.S.) ■ Computers are to be provided in all classrooms in the future ■ All schools have videoconferencing facilities

Source: VIDE

ICT in primary and secondary schools

ICT implementation in the Virgin Islands remains challenging, however planning and procurement strongly emphasize the implementation of technology to support learning across the curriculum rather than the use PC workstations to gain IT skills. Explorations of broader uses of ICT have resulted in special projects intended to increase the benefits of technology for teachers, students, and families.

The VIDE includes an Office of Instructional Technology. This office provides trouble-shooting, maintenance, and consultation to schools and school districts, and manages ICT systems that include EMIS, VTC, and educational networks and network services. The office also provides TPD and interacts monthly with all school-based IT coordinators. Staffing is currently an issue.

In contrast to most ICT programs in Caribbean school systems, a separate ICT curriculum has not been developed. (Virgin Islands students do not take the CXC exams.) The VIDE has instead made use of the ISTE National Education Technology Standards (NETS) as a framework for development of curricula that integrate ICT more comprehensively and effectively.

Additional initiatives in secondary schools have focused on using ICT to enhance teaching, learning, and management. These initiatives include: introduction of digital whiteboards, establishment of a telephone homework hotline (in 30 percent of

schools) that enables family members to keep up to date about students' homework, and the use of Discovery Education's Digital Curriculum—an on-demand video library of standards-based content supported by lesson plans, activities, and assessments.

Digital white boards are large flat-screen touch-screen monitors that enable teachers and students to write, diagram, move elements, and record their work. Digital white boards can also display computer or Internet-based video and other dynamic content.

Secondary schools

All junior and senior secondary schools in the Virgin Islands have computer labs and broadband Internet connections (45 Mbps. avg.). Central High School on St. Croix, with approximately 1,300 students, has at least seven computer labs,¹³ each supporting learning in a separate curriculum subject.

Homework hotline and help desk

The VIDE Homework Hotline is designed to increase the connections of parents and family members to schools, to increase their involvement in students' schoolwork, and to assist students in remaining up to date with their homework assignments. Teachers have access to telephones (in teachers lounges, school offices, and many classrooms) that enable them to leave assignment and other information in voice-mail boxes, receive messages from parents, and respond to messages when necessary. (For more information about the

¹³ Respondents have indicated that Central High School may have as many as eight labs.

Teacher Professional Development Programs

TPD program type	Target population	Objectives	Scale	Barriers
Initiatives targeting specific technologies	In-service teachers	■ Introduce teachers to tools such as digital whiteboard, digital curriculum video, etc.	■ Unknown	■ Unknown
VIDE TPD program	In-service teachers	■ Provide relevant monthly TPD to in-service teachers addressing a variety of topics	■ Voluntary in nature, the scale is unknown	■ The distributed archipelagic geography of the Virgin Islands limits participation

Source: VIDE

VIDE's VOIP-based telephone network, please see the section, "Project profile: VOIP telephone network, US Virgin Islands.")

The Division of Libraries, Archives, and Museums maintains an Internet-based homework helpdesk. Students can send Web mail messages to reference librarians who assist in identifying resources and in other ways.

Teacher professional development

Virgin Islands teachers are required to hold bachelors degrees and to be certified by the Virgin Islands Board of Education. UVI Division of Education offers a B.Ed. in Elementary Education, an M.A. in Education and a Secondary Teacher Preparation program that enables students in other disciplines to prepare for teacher-certification exams.

In addition to the Praxis certification exam and an English-proficiency exam, applicants for certification are required to pass a Computer Literacy Exam (CLE). In many schools, teachers are required to use email to remain up to date on faculty-wide or systemwide communications.

Students do not receive ICT training as part of the Division of Education curriculum, but they may elect to take ICT-related courses from the UVI Business Division.

UVI does not offer ICT-specific in-service TPD. However, in-service teachers may enroll in courses within the Division of Education that address use of

ICT in teaching and learning (e.g., instructional design and technology).

Tertiary education

UVI makes use of ICT to support teacher and student access to information for both research and instructional purposes.

Together the St. Croix and St. Thomas campuses have approximately 10 computer labs with Internet connections available for use by students. Roughly 50 e-learning courses are available via the UVI Blackboard Learning System. Included in the online curriculum is a CLE-preparatory course. The library on the St. Thomas includes a media center housing audio-visual resources and hardware. The university also maintains a well-utilized telephone-accessible help desk for ICT-related problems.

In addition, 8 to 12 facilities on the two campuses offer VTC capabilities. These are used to enable DE instruction between the two campuses, and to link UVI students to courses at other institutions.

The UVI Business Division offers a B.A. degree with a variety of concentrations, including Computer Information Systems, as well as an A.A. degree in Computer Information Systems. The Business Division computer lab is designed for the use of students enrolled in Business Division ICT classes

Nonformal, distance, and open education

The Virgin Islands is a recipient of funding from the U.S. Libraries program of the Bill and Melinda Gates Foundation. The program funds acquisition of computers and Internet hardware for public libraries to enable them to provide ICT access and

training to patrons free of charge. There are approximately five libraries on the island of St. Croix, two on St. Thomas, and one on St. John.

Several schools also regularly open computers labs to family members and members of the PTA, enabling them to use computers and the Internet. IT teachers and, on occasion, students may offer training as well.

EMIS and use of ICT by the DOE

As with many school districts and states in the USA, the Virgin Islands has implemented EMIS using the Pearson School Systems SASI software. This software has been in place since at least the late 1990s. Although implementation is far from perfect in schools or throughout the system, the SASI software is mature and EMIS in the Virgin Islands generates accurate information. More recently, the Government of the Virgin Islands has begun to implement a vertical Enterprise Resource Planning (ERP) system in all departments. To increase accountability and efficiency and to improve overall management, the system links local planning and expenditures, such as school-level budgeting, procurement and allocations to departmental and government-wide DBMS. The project is currently in its first phase.

Overall, the technical capacity within the VIDE is relatively high. It is, in addition, worthwhile to note especially in relation to the struggles with EMIS within the region that the Virgin Islands receives technical assistance and support from the USED and others.

Barriers and challenges

- **Technical support:** In this regard the experience in the US Virgin Islands broadly reflects that of the region. The challenges presented by the secondary-school ICT installations, however, are more substantial with regard to the diverse range of tools supported: schools have multiple

computer labs, several digital whiteboards, and VTC facilities; the USED also maintains a Web mail service for teachers and students, Web hosting of school sites, and other services. As of 2007, one staff person is responsible for these installations and services for the island of St. Thomas.

- **Island topography:** As in many countries in the region, the education system is challenged in part by the fact that the country is an archipelago. In the case of the Virgin Islands, each island maintains a separate school district. In the VIDE's relatively decentralized system, schools and school districts each have their own budgets, increasing the requirements for coordination of procurement, technical support, and other services.

The education system overall is also challenged by strongly different conditions for rural and urban schools. In part, of course, ICT represents a means of overcoming such challenges. But variations in school catchments and enrollments, the relative wealth of communities, and other factors have the potential to re-cast ICT as an additional area of challenge in relation to educational equity.

- **TPD and support technology integration:** At present, the VIDE provides TPD centrally, with the teacher traveling to attend pull-out workshops. Although adequate in some cases for the development or reinforcement of technology skills, this structure provides limited support for efforts to integrate ICT into classroom curricula. Teachers return to their schools, attempt projects taking advantage of ICT, and encounter obstacles that cause delay, diminish achievement, and reduce enthusiasm. Better models could include changing the roles of IT teachers to include more time working with classroom teachers in preparation and implementation, or developing TPD "intensives" in which expert support personnel work on-site with teachers over a specified period of time to introduce ICT-integration methods.



Active learning: A broad term for classroom or online processes, such as collaborative learning or project-based learning, in which students are engaged in guided activities that promote learning; related to “learning by doing,” among other concepts.

Activity: A process or set of actions performed by teachers and students, as in “a classroom activity.”

ADSL (Asymmetric Digital Subscriber Line): A form of broadband connectivity provided by telecommunications companies using existing telephone lines, providing relatively fast transfer of information via the Internet.

Assessment: The act of measuring knowledge, skills and performance, usually in the service of learning.

Bandwidth: The amount and rate of transmission capability of an electronic device. Typically measured in bits per second for *digital* devices (like computers) and in cycles per second for *analog* devices (such as radio). It is the range of frequencies that can be transmitted by phone line, fibre-optic cable, wireless or T-1 line.

Blog (or Web Log): A publicly accessible journal available on the World Wide Web, often allowing visitors to the blog to comment on entries; group blogs may feature the blogs of several, hundreds, or thousands of individuals.

Broadband: A telecommunications signalling method with a wide range of frequencies, enabling faster transmission of data; often fibre-optic cable or ADSL.

Chat (or Instant Messaging): An informal online way of directly connecting people who are online at the same time. AOL Instant Messenger (AIM), ICQ, or iChat client software can be downloaded free.

CAI (Computer Assisted Instruction): A means of delivering educational content and related problem sets in which the learner’s performance is assessed automatically and frequently, with assessment resulting in delivery of new content to address deficiencies.

Collaborative learning: Education that relies on any of several frameworks for activities in which students work together to solve problems, find and structure information, or create reports, playscripts, or other materials; often used interchangeably with “cooperative learning,” although cooperative learning may be used to refer more specifically to pedagogical techniques involving structured assignments and assessment protocols.

Connectivity: The ability to access an electronic network to send and receive information between locations or devices; connectivity is typically provided using telephone lines, wireless signals, satellite communications, and other, similar means.

Cooperative learning: See “Collaborative learning.”

Courseware: Educational software, typically enabling learning of a specific curriculum.

Curriculum: A fixed course of study in a particular subject area at a certain developmental point (e.g., age or grade), in which students address specific, related topics and skills and are assessed on those topics and skills.

Database Management System (DBMS): Software that supports development and use of an electronic database.

Distance Education (DE): Courses typically at the college-level (but also including agricultural extension and other non-formal forms of learning) in which students do not visit a school campus for every class; in developing countries, often relying on

printed materials and the postal service, but increasingly making use of computers, the Internet, mobile telephony and other means.

E-learning: A style of learning in which students interact with digitally delivered content, services and support, often including a distant teacher; although most widely applied to Web-based learning, “e-learning” is also used to refer to learning via satellite TV, DVD, and/or CD-ROM, and is in many instances a sub-set of DE (see “Distance Education”).

EMIS (Education Management Information System): A technological system for collecting, storing, retrieving, and analyzing information about an education system to support planning and administration; EMIS typically involves teachers and schools uploading data to a central system; information may include anything from student attendance and grades to the size and condition of school facilities.

Geographic Information System (GIS): Hardware and software used to store, retrieve, map and analyze geographic data, usually oriented in relation to Earth coordinates.

Gross Enrollment Ratio (GER): Information indicating the levels of education attained by members of a specific population.

Information and Communications Technology (ICT): Any technology (mainly digital but also analog) that allows users to create, store, display information in all its forms (text, images, video, audio) or communicate with others over a distance, such as computers, television, handheld computers, radio, audiocassettes, DVD and CD players, cell phones, networks, and the convergence of any of these technologies.

Inquiry-based learning: A form of learning activity in which students observe and question phenomena; pose explanations of what they see; devise and conduct tests to support or contradict their theories; analyze data; draw conclusions from experimental data; design and build models; or any combination of these.

Interactivity: The level of influence that the learner has over educational activities and events; typically

used to refer to the design of learning activities and especially educational software and the use of ICT; a highly interactive classroom activity might ask students to set objectives, and determine the activities that will accomplish those objectives as well as the means of assessment; a highly interactive software application might ask students to make choices as to how a problem will be solved.

Internet: A network of networks with worldwide scale, in which millions of computers are interconnected through standardized protocols (TCP/IP).

ISP (Internet Service Provider): An entity that provides individuals and organizations access to the Internet.

LAN (Local Area Network): A network connecting computers that are in the same physical location, such as a school or classroom.

Learner-centered/Student-centered: Instruction based on the belief that students are natural learners, who are more motivated to learn when given the freedom and autonomy to solve authentic problems, work on real-world projects or employ real-world tools, collaborate with peers, and are given greater responsibility and voice in how their work will be assessed.

Learning Management System (LMS): Software that either manages or enables educators to manage students’ learning activities, typically by offering Web-based course enrollment functions, delivery of appropriate learning resources and assessments, and course completion notification, as well as many other functions; also known as a Learning Content Management System.

Lesson plan: A teacher-developed and teacher-written study plan that guides instruction; may contain an outline of the important points of a lesson arranged in sequential order, including the activities of the student and instructor, the specific learning objectives for that lesson, the resources and materials to be used, and how and when to use them.

One-to-one computing (or 1:1): Classroom-, school-, district- or system-wide provision of computers, typically laptops, to students; laptops and other mobile devices enable students to use computers in all classes and at home.

Open Source: Open source refers to any program whose source code is made freely available for use and modification as users or other developers see fit; also sometimes referred to as “Free and Open Source Software” (FOSS) and “Free/Libre and Open Source Software”).

Outcome: The effect of program or project activities on the beliefs, behaviors, skills, knowledge, attitudes or affect of the targeted population. Outcomes can also be non-personal: access to resources, changes in policies, improvements in environmental conditions, etc.

Pedagogy: The science of teaching and the methods used to teach.

Podcasting: A method of publishing audio broadcasts via the Internet, allowing users to subscribe to a feed of new MP3 files that can be downloaded to portable music players or to computers; podcasting uses a syndication model—such as RSS—to deliver an enclosed file automatically. Podcasting enables independent producers to create self-published, syndicated “radio shows,” and gives broadcast radio programs a new distribution method.

Project-based Learning (PBL): An instructional strategy that provides meaningful, active and productive contexts for learning, and that allows students to access and manage the information they gather; distinct from “Problem-based Learning” (also referred to as “PBL”), a teaching technique that emerged from medical schools and that emphasizes assigning student groups diagnostic or other problems to be solved independently.

School leaver: Any student who stops attending school, whether by dropping out or by graduating.

SIDS (Small Island Developing States): Island countries, typically remote, with small populations, limited resources, whose vulnerability to natural disasters and external economic shocks pose challenges to their sustainable development.

Simulation software: Computer code that represents processes, activities, or an environment, enabling learners to interactively experience the effects of changes in specific variables; examples include a simulation in which learners adjust the

length of the pendulum to see how length affects periodicity, and more complex off-the-shelf games such as SimCity Societies (simcitysocieties.ea.com).

SMS (Short Message Service): A service that allows short text messages to be sent between mobile phones.

Sustainability: The capacity of a program, project or other intervention to continue its activities over time.

Teacher Professional Development (TPD): The provision of learning opportunities to teachers intended to enable them to advance their knowledge of their subject areas, their teaching practices or other components of their careers in education; typically indicates learning opportunities that are both more broad and more focused on pedagogy than those provided in “training”; often qualified as “pre-service” and “in-service.”

Technical/Vocational Education and Training (TVET): Programs that enable learning of work-related skills, knowledge, and behaviors.

Technology integration: The use of technology by teachers and students as a tool to support learning objectives, enhance instruction, and improve student learning in any subject in the school curriculum (exclusive of IT courses); technology integration may be designed to build students technology skills, but only in the course of improving their mastery of curriculum content.

Tertiary Level Institution (TLI): Universities, colleges, polytechnic institutes, and other organizations that provide education to graduates of secondary school.

Thin-client network: A LAN that links computer terminals (“thin clients” or “dumb terminals”) to a server that provides them with software applications and information-processing services; the server may also be used to store users’ data.

Total Cost of Ownership (TCO): A method of developing financial estimates of the cost of purchasing, maintaining and disposing of computer hardware, software and systems; TCO estimates may include installation, training, electricity or other costs associated with purchase and use.

VSAT (Very Small Aperture Transmission): A small, earth-based transceiver that transmits digitally to satellites at high speeds.

WAN (Wide Area Network): A network connecting computers or other devices that are spread out across several locations; a WAN might connect all the schools in a district.

Web 2.0: Any of a loose group of technologies, such as blogs and social-networking sites, that promotes the use of creativity, collaboration, and sharing to achieve results that are desired in common.

Wiki: Software that allows users to create, edit, and link Web pages, often in collaboration with other users.

Wireless: The ability of one ICT device (computer, cell phone) to communicate with another without cables or wires.

World Wide Web: An information-representation method that operates via the Internet to enable users to access resources that may contain text, images and sounds, and that display in a standard fashion on many computers and software applications.

SURVEY OF ICT AND EDUCATION IN THE CARIBBEAN

A Summary Report, Based on 16 Country Surveys

This project seeks to gather together in a single resource the most relevant and useful information on ICT in education activities in the Caribbean.

The study addresses the following general topics:

- The state of policy and planning
- Current usage of ICT in the primary, secondary and tertiary education systems
- Pre-service and in-service teacher professional development (TPD)
- Critical challenges

Contents:

- Regional trends in ICT in Caribbean education
- Global trends in ICT and education, and their relevance to the Caribbean context
- Selected regional ICT initiatives in education
- Regional and national EMIS initiatives

This Summary Report is complemented by 16 separate Country Reports addressing policy and planning; ICT in primary and secondary schools; TPD; tertiary education; non-formal learning and TVET; education management information systems (EMIS) and Ministry of Education (MOE) capacity; barriers and challenges.

Please note that Cuba, the Dominican Republic, Haiti, and the U.S. Commonwealth Territory of Puerto Rico are not included in this survey.

About infoDev

infoDev is a partnership of international development agencies, coordinated and served by an expert Secretariat housed in the Global ICT Department (GICT) of the World Bank, one of its key donors and founders. It acts as a neutral convener of dialogue, and as a coordinator of joint action among bilateral and multilateral donors—supporting global sharing of information on ICT for development (ICT4D), and helping to reduce duplication of efforts and investments. To this end, *infoDev* sponsors cutting-edge research and analysis to help identify global best practice in the use of ICT4D.