EDUCATION FOR ALL IN THE CARIBBEAN: ASSESSMENT 2000 MONOGRAPH SERIES

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Introduction of Information Technology to Schools in Jamaica

Paula Daley-Morris

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FOREWORD

Education for All in the Caribbean: Assessment 2000 is a remarkable output, which is the culmination of intensive collaborative efforts between the countries of the Caribbean sub-region, the Regional Advisory Technical Group and the EFA Forum Secretariat, and relevant agencies and institutions.

The Country Reports, Monograph Series, and Case Studies highlight and pinpoint, in an extremely effective manner, some of the issues and concerns that drive education policy and action in the Caribbean. At the same time, the documentation presents a balanced and informed overview of the rich and varied educational and cultural experience of the sub-region; a knowledge which is critical to the understanding of the unfolding social and economic developments.

UNESCO is pleased to have been associated with this endeavour, particularly through our regional office in Kingston, Jamaica which, as co-ordinator of the Regional Advisory Group for the Caribbean Sub-region, was integrally involved in every aspect of the exercise. We look forward to continued collaboration with the Caribbean on activities of a mutually rewarding nature as the consequences and implications of the EFA Assessment become manifest.

Colin Power
Deputy Director-General for Education
UNESCO

SERIES INTRODUCTION

At Jomtien in 1990, member states of the United Nations adopted the *Framework for Action to Meet Basic Learning Needs* and created the International Consultative Forum on Education for All (EFA Forum). One decade later, the EFA Forum embarked on an assessment of this initiative, intended to assist member states in examining their education provisions to inform the formulation of policy. Once the Caribbean EFA Regional Advisory Group had embarked seriously on the assessment, it was quickly realised that it would be difficult to capture, in any one place, an assessment of all that had transpired in education in the Caribbean during the period 1990-1999. Moreover, the technical guidelines constrained assessors to specifics within quantitative and qualitative frames. However, because it was felt that education in the Caribbean is too dynamic to be circumscribed, the idea of a more wide-ranging monograph series was conceived.

Researchers, education practitioners, and other stakeholders in education were invited to contribute to the series. Our expectations were that the response would be quite moderate, given the short time-frame within which we had to work. Instead, we were overwhelmed by the response, both in terms of the number of enthusiastic contributors and the range of topics represented.

Caribbean governments and peoples have invested in the *hardware* for education--buildings, furniture, equipment; in the *software*, in terms of parent support and counselling services; and they have attended to *inputs* like books and other teaching/learning resources. They have wrestled with ways to evaluate, having gone through rounds of different national examinations, and modifications of ways to assess both primary and secondary education.

But, as the efforts to complete the country reports show, it has been more difficult to assess the impacts, if we take the eventual aim of education as improving the quality of life--we have had mixed successes. That the sub-region has maintained relative peace despite its violent past and contemporary upheavals may be cited as a measure of success; that the environment is threatened in several ways may be one of the indicators of how chequered the success has been.

Writers in the monograph/case study series have been able to document, in descriptive and analytic modes, some of the attempts, and to capture several of the impacts. That this series of monographs on Education for All in the Caribbean has been written, edited, and published in nine months (from first call for papers to issue of the published titles) is itself an indication of the impact of education, in terms of human capability and capacity.

It reflects, too, the interest in education of a number of stakeholders without whom the series would not have been possible. Firstly, the work of the writers is acknowledged. All worked willingly, hard, well, and, in most cases, without material reward. The sterling contribution of the editor, who identified writers and stayed with them to the end of the process, is also recognised, as is the work of the printer, who came through on time despite the severe time constraints. The financial contribution of the following agencies also made the EFA assessment process and the publication of the monograph/case study series possible: Caribbean Development Bank (CDB), Commonwealth of Learning (COL), Department for International Development (DFID), International Labour Organization (ILO), Sub-Regional Headquarters for the Caribbean of the United Nations Economic Commission for Latin America and the Caribbean (UNECLAC), United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Population Fund (UNFPA), the United Nations Children's Fund (UNICEF), The University of the West Indies, Cave Hill; the World Bank, and the UN country teams based in Barbados, Guyana, Haiti, Jamaica, and Trinidad and Tobago.

We invite you to peruse individual titles or the entire series as, together, we assess Caribbean progress in education to date, and determine strategies to correct imbalances and sustain positive impacts, as we move towards and through the first decade of the new millennium

Claudia Harvey
UNESCO Representative and Coordinator, Regional Technical Advisory Group (RTAG)
EFA in the Caribbean: Assessment 2000

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PREFACE

This monograph on progress in the use of technology to improve access to, and quality of, education, represents the results of research by the Computer Studies Section of the Department of Educational Studies, The University of the West Indies (UWI), Mona. It seeks to increase awareness of both the achievements and setbacks experienced by the Jamaican education sector in the effort to increase the use of computers in education. It also seeks to validate claims made by educators with respect to the provision of quality information technology (IT) training for Jamaican students, and to address a few other issues that are of national importance, as reflected in the frequency with which they are debated.

The information in this monograph is based on the author's unique experiences. The desire to collate this information was stimulated by the Caribbean Computer Educators Conference which was held in Jamaica in April 1999. That event brought together educators from more than 10 Caribbean countries, as well as IT leaders from every sector of the Jamaican society. The author was amazed at the apparent lack of knowledge of many of the participants, as they openly expressed ignorance of the varied computer innovations that exist throughout Jamaica and the Caribbean.

The main purpose of this monograph is to inform the public of advancements, failures, and successes surrounding the use of computers in the Caribbean during the decade of the 1990s, with particular emphasis on those occurring in Jamaica. The intent is to stimulate public interest which should, in turn, create public discussions, bringing to the fore as many varied viewpoints as possible. Each part of the monograph raises different issues and provides new information on successes achieved.

It is hoped that this monograph will stimulate the interest of educators, university students, government officers, and parents in the Caribbean. It should also interest researchers at foreign universities who may wish to expand their knowledge of the issues surrounding the computerisation of Jamaica's education system, and obtain information on the performance of students in the Caribbean Examinations Council (CXC) Information Technology examinations.

The preparation of this monograph was made possible through the guidance of Professor Errol Miller, the kind cooperation of Mr. Ian Furlonge, and the meticulous scrutiny of Charmaine Mc Kenzie and Dr. Beverly Bryan, who gave invaluable assistance in the area of editing and motivation.

Paula Daley-Morris
July 1999

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LIST OF ACRONYMS AND ABBREVIATIONS

CAPE	Caribbean Advanced Proficiency Examinations
CSEC	Caribbean Secondary Education Certificate
CXC	Caribbean Examinations Council
HEART	Human and Employment and Resource Training
IDB	Inter-American Development Bank
IT	Information Technology
JCS	Jamaica Computer Society
JCSEF	Jamaica Computer Society Education Foundation
SBA	School-Based Assessment
USA	United States of America
UWI	The University of the West Indies

About the Author

Paula Daley-Morris is a lecturer at the Department of Educational Studies, The University of the West Indies (UWI), Mona. She was previously employed with the Jamaican Ministry of Education and Culture, where she served as the country's first Education Officer with responsibility for overseeing the use of information technology in schools.

ABSTRACT

As a developing nation, Jamaica continues to experience economic challenges that have far-reaching implications for all sectors of the society. Education For All (EFA) is a concept that Jamaica has tried to embrace for more than two decades. One of the nation's goals for the 21st century is to raise the quality of education for all its citizens, thus equipping them to be productive contributors to societal growth. Recently, Jamaica turned its attention to information technology (IT), with particular attention to the education sector, because it saw its introduction as a proverbial "Black Starliner;" a means by which the country's economic prospects could be changed. In the early 1990s, the Jamaica Computer Society Education Foundation (JCSEF) launched an initiative to facilitate the establishment of computer laboratories in secondary schools. These laboratories were to be used to train students to use computers in the workplace, and to prepare them to sit external examinations that were internationally accredited. As a result of this initiative, 90% of the island's secondary schools were equipped with computer laboratories which facilitated students doing the Caribbean Examinations Council's (CXC) IT examination. The impact of this project enabled the focus on computerisation to be expanded to include primary schools, enabling them to be equipped with computers and to have their teachers trained to use them to aid learning.

This monograph describes the initiatives that enabled the introduction of computers in Jamaican primary and secondary schools. It also describes the student performance on the CXC IT examination over a period of six years. The results show that each year more candidates were entered for the Technical Proficiency level than for the General Proficiency level of the examination. It further shows that student performance at the General Proficiency level steadily improved over the six years, while it fluctuated at the Technical Proficiency level. It highlights the fact that the performance of Jamaican candidates improved significantly in the year CXC instituted the six-point grading system. However, most of the passes were below the Grade I level. The data suggest that there may be deficiencies in the education system that caused IT teachers to show a preference for teaching the Technical Proficiency syllabus. The implications for this occurrence as it relates to tertiary level training in computer science are discussed.

INTRODUCTION

The World Conference on Education for All (EFA), held in Jomtien, Thailand in 1990, drew world attention to the importance of basic education for all. At Jomtien, attention was brought to bear on the needs of minorities, girls, and women, highlighting the difficulties they faced with respect to their ability to access quality learning. After Jomtien, Caribbean governments met and decided that one of the most important basic education goals that they would seek to address was the increased access to information technology to schools. This, they felt, was of paramount importance, as it would help citizens to more effectively treat the imminent economic and social challenges that the information age would present.

This monograph examines initiatives that sought to address the goals of Jomtien and, more specifically, those that were set by Caribbean governments. In the preparation of this monograph, the author reviewed the relevant literature and examined project reports, evaluation documents, and policy statements. Interviews were also conducted to verify pertinent information. Both Parts 1 and 2 will show that marked gains were made during the period of the EFA Assessment.

Part 1 focuses on the Jamaica Computer Society (JCS) and its work in assisting the Ministry of Education to make computer technology accessible to all institutions of learning by the year 2000. As a result of its work between 1992 and 1999, the Project 2000 initiative enabled 128 institutions--84 secondary, 19 tertiary, 22 primary, and 3 vocational institutions--to establish computer laboratories. Similarly, between 1994 and 2000, Project 2020 further enabled 17 primary schools to establish computer teaching labs (JCSEF, 1999). Part 1 also explores a third initiative that sought to provide learning institutions with access to computer technology. This initiative, the EduNet Project, was introduced in 1997 and is administered by the Ministry of Education. Through this project, 96 schools were equipped with a computer and an Internet connection. They were mandated to use it for data transfer, educational research, and basic inter-school communication. These computers were placed in the offices of principals and formed the core of a Local Area Network. They should eventually be connected to the Ministry's Wide Area Network and proposed Intranet.

Part 2 examines the performance of Jamaican candidates in the CXC Information Technology (IT) examinations during the period 1993-1998. The observed performances are linked to the increase in access to IT tools, and teacher qualifications and training. The performances suggest that increased provisions for computing facilities in Jamaica served as a catalyst for the remarkable increase in the number of students sitting the IT examinations each year. It brings into focus the poor performance of Jamaican candidates in the General Proficiency examination and, at the same time, highlights an annual improvement in the quality of passes received by candidates in the Technical Proficiency examination. It shows a significant increase in the number of candidates entered for the Technical Proficiency and a decline in those entered for the General Proficiency examination. The conclusions drawn from this section of the study are directly linked to the quantitative data analysed from CXC's annual statistical reports for the period 1993-1998.

This monograph will indicate that there has been considerable improvements in access to IT by educational institutions and graduates. It will also document the levels of computer skills achieved by graduates, and the extent to which Jamaican graduates can fill vacancies created by technological advancements. Certainly, Jomtien has touched Jamaica, as it is evident that some of its goals have been realised. Promises with respect to access to computers, computer skills, and computer certification have been fulfilled for all at a basic educational level.

Part 1

Increased Access to and Use of Computers in Jamaican Schools

In the late 1980s, the Jamaican private sector experienced rapid changes in the business environment. In less than a decade, typewriters and calculators became obsolete, as personal computers began to replace them. This was so because the developed world began to trade through modems and network cards, and the "paper trail" which most persons were accustomed to began to disappear. The Jamaican society, in its bid to remain competitive, saw the need to re-tool the work force and enable employees to meet the needs of the computer age. Realising that this costly change was imminent, business planners and financial forecasters had no choice but to turn their attention to the source of human help, the education sector. They very quickly defined the needs of the business sector. As a result, they agreed, in principle, that the people who would be most employable in the new business world should be computer literate.

Pressure was brought to bear on the education sector to enact this change, but it took more than a decade for mechanisms to be put in place to meet the needs. This task was not an easy one, as it was clear that the Jamaican Government was unable to offer financial support, due to Jamaica's debt obligations to the International Monetary Fund and other such institutions. Cameron (1991) reported that, in 1980, the Jamaican education sector experienced a 20% reduction in its subvention to secondary schools. By 1989, only 16.8% of the national budget was allotted to education, as 50% of every dollar earned went towards debt alleviation (pp. 22-24). This situation was a direct result of the structural adjustment programme that was imposed in the 1980s. It made progress challenging, and crippled the government in its bid to stay abreast of technological changes and meet the need for human resource retooling.

According to Nissen (1994), a trading agreement between Caribbean countries and the United States of America (USA) in the late 1980s encouraged off-shore entrepreneurs in their search for cheaper labour. Many US companies seized the opportunity to pay less for usually highly-paid tasks, by taking advantage of the skills gap that existed in Jamaica. Between 1985 to 1989, many US entrepreneurs opened businesses and employed many Jamaicans in positions such as word processing, key punching, and data entry clerks. These companies provided on- the-job as well as off-the-job training for new employees. Despite these training opportunities, many of the persons who became employed in this sector later lost their jobs because they lacked the necessary prerequisite skills. This development made evident, to stakeholders, the need to implement a curricular change which would target secondary graduates.

In 1990, the education sector endorsed the establishment of a body with a mandate to come up with strategies to meet Jamaica's technological needs in a systematic way. The JCS, which was already in existence, took up the challenge and added an arm which it called the Jamaica Computer Society Education Foundation (JCSEF). The principal goal of this organisation was "to ensure that, by the Year 2000, all graduates of Jamaican secondary schools, teachers' colleges and community colleges will have access to technology-based education - an important part of their preparation for effective functioning in the competitive work environment" (www.jadigiport.com/jcsef/html/project.html). This would ensure that Jamaica produced, on an on-going basis, graduates who are technologically skilled (Jamaica. Ministry of Education, 1998).

The JCSEF lobbied for the addition of IT to CXC's list of subjects. It is directly responsible for the inclusion of computer learning in Jamaican primary schools and also for the implementation of two landmark initiatives: Project 2000 and Project 2020. The following sections will describe these two projects in detail and highlight their effects, so far, on Jamaica's education system.

The Jamaica Computer Society's Initiatives

The Project 2000 initiative

Project 2000 was the first major initiative of the JCSEF. It emerged in 1992 out of a partnership between the JCSEF, the Human Employment and Resource Training (HEART) Trust, and the private sector. The HEART Trust contributed approximately J $60 million to this initiative. The aim of this project was to establish 15-station computer laboratories in each secondary school, community college, and teachers' college, and to provide in-service training for teachers (Jamaica. Ministry of Education (MOE), 1998).

To benefit from this programme, schools were required to pay 20% of the cost to establish a 15-station networked computer laboratory. They were encouraged to approach a business partner to sponsor 40% of the cost, and the Foundation, through its funding body HEART Trust, supplied the final 40%. Several secondary and tertiary institutions benefited from this project. To date, over 128 institutions have managed to establish training laboratories. Most of these laboratories are used to prepare students to sit CXC's Caribbean Secondary Education Certificate (CSEC) and the Caribbean Advanced Proficiency Examination (CAPE) IT examinations. This funding is still available and is being utilised by many.

The Project 2000 initiative will end December 31, 2000. It is encouraging to note that of the 140 secondary institutions in Jamaica, 60% have managed to establish a computer laboratory through the project. The impact of this project on access to quality basic education is examined in Part 2 of this monograph, as Jamaica seeks to increase its pool of computer professionals.

The Project 2020 initiative

In 1993, when the secondary programme was well under way and experiencing success, the JCSEF turned its attention to the primary schools. The view was that if computerisation was to be successful, it was necessary to equip primary schools. They felt, however, that the primary system required a new approach. Consequently, another initiative, Project 2020 was launched. This initiative was modelled on the 2000 project. The only difference was that it sought to equip primary and all age schools with computers, and took the idea a bit further to include the use of computers to aid teaching and learning.

In the summer of 1993, an Autoskills Reading Software pilot programme, which was of Canadian origin and which was recommended as a literacy enhancement tool, was implemented, using students from an urban primary school. The sample included 15 students who were tested using the software. A reading level was established based on the number of reading errors made in each pre-test: (a) Oral, (b) Auditory, and (c) Visual reading. This activity provided formative data for the project. Subsequently, the students were exposed to 30 hours of class with Autoskills. At the end of the period, a post-test was done on the computer and the results were compared with those from the pre-test. A report on the observed changes on the test scores indicated that the number of errors that the students recorded in the post-test was significantly lower than those recorded in the pre-test. These conclusions were drawn based on a 0.05 probability level (Jamaica Computer Society Education Foundation (JCSEF), 1994).

In that year, the movement towards using computers to assist with the delivery of instruction heightened, as attention was once more drawn to Autoskills. The experiment was duplicated at a high school to see whether Autoskills could also be used to solve Grade 7 literacy problems at that level. This time, the software was used, over a semester, with students who were screened and found to have reading problems. A report was produced which stated that the performance of the students who were exposed to Autoskills was superior at the post-test, when compared with the pre-test scores (JCSEF, 1994).

In 1995, the JCSEF received US $1 million from the Inter-American Development Bank (IDB), through its multi-lateral investment fund, to assist with the implementation of Project 2020. The schools

that were used in the pilot were located in the parishes of St. Elizabeth, St. Mary, St. Catherine, and Clarendon. The decision to place the project in these parishes was based on the knowledge that the IDB computer laboratories would be placed in primary schools located in areas where labs already existed in secondary or tertiary institutions. This led to the establishment of clusters. Four clusters were established: at Malvern, St. Elizabeth; Oracabessa, St. Mary; Above Rocks, St. Mary; and Frankfield, Clarendon. Each cluster had approximately five schools. The main objectives of Project 2020 were: (a) to improve literacy and numeracy, and (b) to stimulate creative thinking and high-level learning through the use of the software. An additional goal was the promotion of private and public sector partnerships to foster sustainability.

The project ran for one year on IDB funds and, towards the end of the year, the JCSEF began to experience a shortage of funds. The World Bank was approached for funding and agreement was reached on the sum of US $500,000.00. This project was to be seen as the Jamaican partnership for technology in basic education. It was called INFODEV and was expected to enable Jamaica to strengthen its emphasis on literacy acquisition in education (reading, writing, and numeracy); explore how computational and communications technologies could contribute to literacy learning in primary and secondary schools; and evaluate the outcomes of these interventions for possible replication on a large scale (MOE, 1996b). The Bank also stipulated that, for the funds to be granted, the JCSEF had to work in partnership with the Ministry of Education and The University of the West Indies (UWI).

This aspect of the mandate became necessary as, before the granting funds, the World Bank met with the three stakeholders and concluded that they each had valid, but differing, ideas on computerisation. The positions held were as follows:

- The JCSEF was of the view that Autoskills had been tried and tested, and based on its track record, should form the core of software explorations.
- UWI felt that experimentation could prove to be beneficial and, therefore, several approaches to computerisation and literacy acquisition should be explored.
- The Ministry of Education felt that the successes reported with Autoskills needed investigation.

The World Bank felt that the scepticism that surrounded the way forward warranted a new approach from which all could learn. The World Bank official felt that the implementation of the INFODEV initiative would enable the Jamaica 2000 programme to strengthen its emphasis on literacy in education (reading, writing, and mathematics). He wrote:

> The public at-large value the role of computers in education. I believe, however, it is important that the Jamaica 2000 project should not create unrealistic expectations that computers are some kind of panacea for the ills of the education system. In proposing to tackle the problems of literacy and numeracy with computers, the Jamaica 2000 project risk giving a false impression that computers offer the answer to overcoming the shortcomings of the education system. (Potashnick, 1996)

The funding for the project materialised in 1997 after an agreement was reached between the IDB and the World Bank to combine efforts. The funding was used to spearhead Part II, Project 2020, which included the following:

- a staff development summer workshop for teachers who were already on the 2020 project;
- experimentation with models of computers in education (laptops for teaching and learning);
- computers on trolleys, multimedia enhancement of pre-service education and computers in a one-room school, and research (basic data about the deployment of computers);

- research designed to create a better understanding of the Autoskills software on literacy;
- an intense, case-based research on two clusters, intended to document the process of integration of technology in the schools and to identify possible effects (Potashnick, 1996).

In general, stakeholders agreed with Potashnick's recommendations. They felt that this new approach would serve two purposes: doubling the gains indicated by the Autoskills reports and, at the same time, creating a more rounded basic education system for children in primary schools.

Project 2020 was implemented between October 1997 and February 1999, one year later than planned. The difference between the time of approval and the actual start up of the project meant that inflation had reduced the number of goals that could realistically be realised. This meant that the JCSEF had to take a decision to scale down the initiatives. The scaling-down process resulted in the implementation of the following initiatives:

- Ethnographic/case studies of clusters of schools.
- Evaluation of two models of computer usage: (a) laptop computers in project-based learning activities, and (b) use of computers on trolleys to facilitate computer-assisted teaching and learning in a primary school.
- Study of the gains attained through the use of three integrated learning software in teaching (JCSEF, 1999, p. 7).

Based on a comparison of the computer test scores with those derived from the independent diagnostic tests, the main findings were as follows.

- The data generated from all schools in the experimental group showed that, through the use of three commercially-acquired integrated software packages, subjects in the experimental group showed satisfactory learning gains in mathematics, language arts, and reading.
- The use of commercially-acquired integrated learning software in this project proved to be expensive, and replication in Jamaica's 344 primary, 29 infant, and 55 junior high and primary schools was not economically viable, as the learning gains observed were insignificant when compared to the costs incurred.
- With respect to teachers' and students' attitudes, the use of the computers in teaching had a positive impact on the schools. The teachers appeared to be more enthused about and, generally, more interested in their students. The report also indicated that the presence of the computer lab in the schools encouraged sharing of ideas among teachers and created a co-operative environment in the schools. For example, in at least two schools, the teachers produced reading cards for all students to use with the computer software. In approximately 16 of the 17 schools, the principal noted an increase in student attendance in classes that were involved in the project.

Finally, the evaluator highly recommended the use of integrated learning software in teaching and learning situations, as they have the potential to stimulate interest and promote learning, especially in situations where there are large pockets of illiteracy. It was recommended, however, that this software be supplemented by carefully developed, systematic instructional design coupled with the use of other technologies in an effort to maximise the gains (JCSEF, 1999).

The Initiative of the Ministry of Education

The EduNet Project

For many years, the JCSEF spearheaded the drive to computerise Jamaican schools, with a view to improving the basic education of children. The Ministry's role in Project 2020 created an interest in the process of computerisation and use of technology to aid school improvement and facilitate learning.

In his 1997 budget speech, the Prime Minister, the Hon. P. J. Patterson announced that, by the year 2000, all schools would have computers. The Prime Minister was heavily criticised, as it was generally known that many schools still lacked such basic amenities as proper sanitation and electricity. In defence of this announcement, the Minister of Education declared that this move was timely and right and should not be viewed as a trade off, but as an intervention that was as necessary as proper sanitation. With those words, the Minister underscored his administration's desire to have every classroom throughout Jamaica connected to the information superhighway by the end of the century. The EduNet Project, which is a collaborative effort of the Ministry of Education, HEART, and the Government of China, was subsequently launched by the Ministry of Education's Planning Unit in 1997.

This project sought to place multimedia computers in schools through funding from the HEART Trust. The short-term goal of this move was to enable the electronic transfer of school data, while providing schools with the stimulant to energise and revolutionise teaching through classroom-based research, collaborative projects, and net-based learning situations. To date, close to 100 schools have benefited and are connected to the Internet and are using it for research and electronic mail (e-mail) transfer. This project is still being implemented by the Media Unit of the Ministry of the Education.

In the interim, an effort is being made to address the funding challenges as plans to raise community awareness are afoot. Schools are expected to use the computers they received to start a local area network. Plans are in the pipeline to establish an intranet for Jamaican schools. The Ministry, in its move to support the growth of this initiative, established a web site with links to non-government organisations, schools, and funding agencies. This web site provides details about the Ministry's operations, including a listing of its projects and the contents of a draft IT policy. This policy addresses the role that computers and other technological tools will play in the advancement of the Jamaican education system. Currently, 120 primary schools have received a multimedia station under EduNet.

Implications for EFA Assessment 2000

Bearing in mind the goals of EFA, these initiatives are all good signs that Jamaica has made an effort to provide quality basic education for all. Jonassen (1996) indicated that, in his experience, children were comfortable using the computer to aid thinking. Computers are mindtools, as he suggested, quoting Simons (1993) as saying "mindtools foster constructive learning, in which learners construct their own knowledge rather than recall the knowledge of the teacher" (p. 11). Jamaica has been able to use the mindtool approach to teaching and learning. Schools that were involved in the 2020 project have been exposed to a classroom where they are encouraged to use computers as a thinking aid. This is evidenced by the results of the integrated software experiment, where it was reported that satisfactory learning gains occurred when software was used to teach. Hence, the evaluator indicated that the approach had the potential to initiate positive attitudinal changes in teachers and to improve literacy and numeracy acquisition in remedial classrooms.

The availability of computers and software in Jamaican schools has created:

- a shift from routine instructional approaches to literacy and numeracy teaching to mindtool-oriented approaches.
- opportunities to fill gaps in teaching and learning through computer usage.

Jamaica's Project 2000, 2020, and EduNet initiatives have facilitated the creation of a mindtool-driven teaching environment that surrounds knowledge building in a constructive way.

One decade after Jomtien, the goal to transform basic education has not fully materialised but the country's aim to produce technology-smart citizens has been fulfilled. As a second step, every teacher's plan must reflect the Jomtien focus, while utilising innovative educational software to assist in delivering aspects of the curriculum. The result is that students have developed confidence in using IT efficiently. Therefore, the thrust for the next decade must be on teacher development; teachers must increase their computing abilities.

The ideas shared in Part 1 of this monograph are good models that small developing countries can study as they seek to modernise their education system. Through collaboration, Jamaica has been able to maximise the use of limited resources while ensuring that the IT infrastructure is strengthened. For example, in schools where money was lacking, community partnerships enabled them to afford the costs associated with acquiring computers. Though the government was unable to purchase 15-station laboratories for every school, they provided what they could: one modern multimedia computer equipped with a modem which allowed schools to link with each other through the Internet. Certainly, Jamaica has managed to provide access to computers and computer education to most, and the country has made projections for the ultimate provision of computer access for all by the year 2020.

PART 2

The Quality of Jamaica's Performance in the CXC Information Technology Examinations, 1993-1998

Part 2 of this monograph provides information on the performance of Jamaican candidates who sat the CXC IT General and Technical Proficiency examinations between 1993 and 1998. It seeks to highlight points of progress and pockets of regression. As was explained in Part 1, several initiatives were introduced into the Jamaican school system to equip schools with computer laboratories for training in IT, among other things.

The introduction of IT as a subject in the CXC examinations is, perhaps, the catalyst that caused the rapid acquisition of computer laboratories in secondary schools. By the end of 1997, the Ministry of Education reported that 50 of 56 traditional high schools, 10 of 14 technical schools, and approximately 32 of 70 comprehensive high schools were equipped with computers which were used to prepare students to sit the IT examinations (MOEYC, 1997b). This part of the monograph will explain CXC's mandate, highlighting its origin, grading philosophy, and purpose. It will seek to document trends in Jamaican candidacy over a 6-year period, 1993-1998, pin-pointing differences in the candidacy for the General and Technical proficiencies. In addition, it highlights the plight of the Jamaican candidates who sat the examination over this period. It will provide information on declines and improvements in candidate performance in both the General and Technical proficiencies. It will seek to link candidate performance to the limitations and strengths of the grading system that was used between 1993 and 1997, and to evalaute the impact that the change in the grading scale, which came into effect in 1998, had on the results earned by Jamaican candidates.

Background Information

The Caribbean Examinations Council was established in 1972 by an agreement among English-speaking Commonwealth Caribbean territories. It has a mandate to provide secondary school-leaving certification that is relevant to the needs of the region, and to ensure that the standard of these examinations are internationally and regionally recognised (www.CXC.org). The examinations administered by the Council are held twice each year, in January and between May and June. CXC's target group is mainly students, 16-19 years old, who want to obtain qualifications for entry into universities and teachers' colleges, and who want to have the basic requirements for certain jobs after leaving high school. Each subject in the CXC has either a General or Basic, or a General and a Technical component. The variations are geared towards providing candidates with generic skills that are of value to further study or the world of work.

CXC Information Technology

Information Technology was introduced as a CXC subject in 1992 and the first group of candidates was examined in June 1993. The IT examinations are administered at two proficiency levels: (a) General Proficiency, and (b) Technical Proficiency. Paper 1 is common to both levels and is compulsory for all IT candidates. It usually consists of 10 questions which are expected to test knowledge from the theoretical dimensions of IT. Papers 2 and 3 are different: at the General Proficiency level, Paper 2 tests the candidates' knowledge of productivity tools (word processing, database, and spreadsheets), while Paper 3

tests information processing and programming skills. However, at the Technical Proficiency level, Paper 2 is divided into three parts: Part 1 usually tests knowledge and skills of word processing, Part 2 tests knowledge and skills related to database management, and Part 3 tests knowledge and skills related to spreadsheet management. All three parts are practical in nature. Both the Technical and General proficiencies have a school-based assessment (SBA) requirement. Here, teachers are given the chance to assess aspects of the student's work. However, the SBA requirements may vary according to the examination. For example:

- the General Proficiency SBA requires its candidates to submit a project for assessment. The project must be prepared over a period of seven or eight months. The project question usually requires candidates to define a problem and to develop mini programs to solve it. The students are required to submit, with the project, supporting explanations of the problem and the solution or solutions generated. It also requires an evaluation of the strengths and weaknesses of the solution that was generated.
- the Technical Proficiency SBA is usually completed over a period of three to four months. It requires the candidates to work through a problem and to use the word processor, spreadsheet, and database applications to generate the solutions.

Before 1998, CXC examinations were assessed using a five-point grading system (I, II, III, IV, V). To each of these grades was attached a profile of I-A, II-B, III-C, IV-D, and V-E. With effect from June 1998, a new grade and profile was introduced, VI-F. Prior to this, only Grades I and II were regarded as passing grades, but Grade III is now regarded as a passing grade. These examinations are important to the Caribbean region as they form the basis on which students are admitted to institutions of higher learning and entry level employment. With the introduction of a Grade III, institutions of higher learning should adjust their matriculation standards to include Grade III as a passing mark. Similarly, employers should accept Grades I, II, and III for employment (CXC, 1998b).

The General Proficiency examination was designed to meet the needs of school leavers who wish to pursue tertiary education, while the Technical Proficiency was designed to meet the needs of school leavers who want to enter the world of work or pursue courses of study aimed at developing specialised technical and vocational skills.

Jamaica's Information Technology Candidacy and Performance

Since 1993, Jamaica has continued to enter candidates for this examination and has reaped mixed results (see Tables 1, 2, and 3).

In 1993, 109 candidates sat the CXC IT examinations. Of this number, 86 (79%) sat the General Proficiency examination while 23 (21%) sat the Technical Proficiency examination. It is noteworthy that the greater percentage of the candidates who sat the examinations in that year was skewed towards the General Proficiency.

Figure 1. General Proficiency 1993.

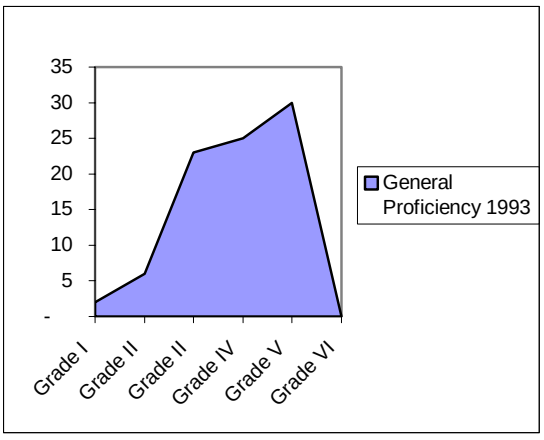
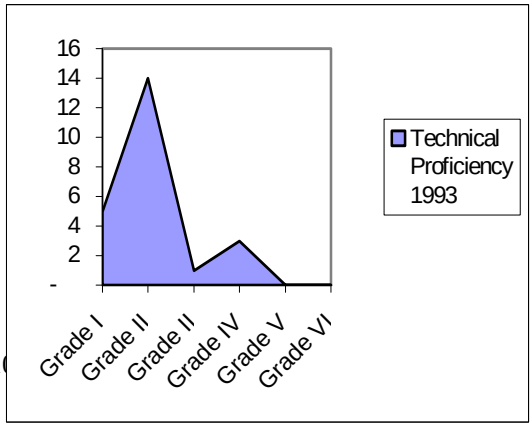


Figure 2. Technical Proficiency 1993.



Figures 1 and 2 illustrate the scores of the General and Technical Proficiency sittings. According to Table 1, 86 General Proficiency candidates sat the examination, and of that number only 8 passed: 2 (2%) Grade I and 6 (7%) Grade II (see Figure 1). The majority of the candidates who sat that examination earned Grade V, the lowest failing grade on the marking scale. Of the 23 that sat the Technical examination (see Figure 2), 19 (83%) passed: 5 (22%) earned Grade I and 14 (61%) Grade II. As can be see in Figure 2, the majority of the candidates earned Grade II, the lowest passing grade on the scale. This is an indication that the candidates who sat the Technical Proficiency examination in that year experienced greater success than those who sat the General Proficiency examination. The peak performance of the candidates who sat the General Proficiency examination occurred at a failing grade, while the peak performance of candidates of the Technical Proficiency occurred at a passing grade.

Figure 3. General Proficiency 1994.

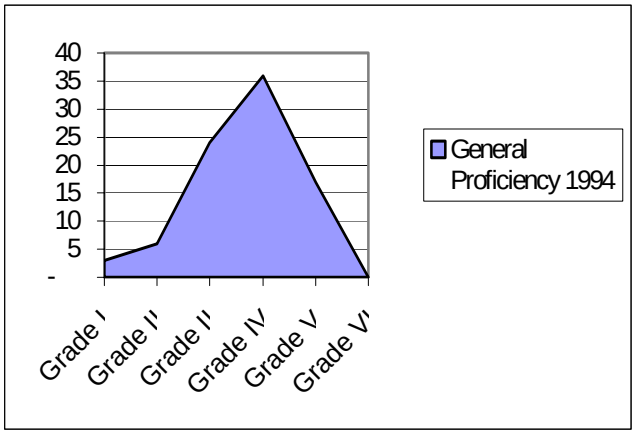
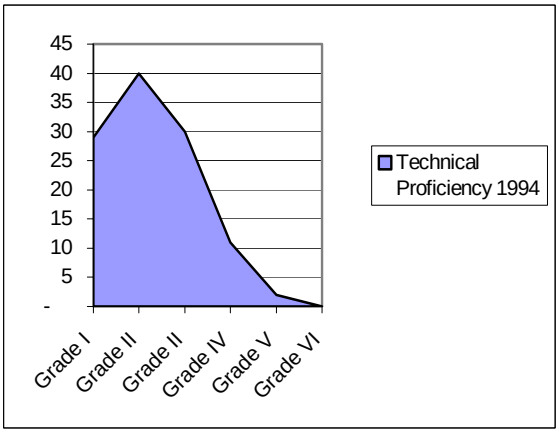


Figure 4. Technical Proficiency 1994.



These results began Jamaica's move towards increasing the number of candidates who sat the Technical Proficiency examination in ensuing years. This increase became evident as early as 1994. In that year, the number of candidates who sat the IT examination increased overall, with a slant towards the Technical Proficiency. In the case of the General Proficiency, 86 candidates sat in both 1993 and 1994. Table 1 shows that the number of candidates who sat the Technical Proficiency increased from 23 (21%) in 1993 to 112 (57%) in 1994, an increase of 36%. Figures 1 and 2 reveal that, in 1994, the results from the General Proficiency were lower than the Technical, as in that year three (3%) candidates earned Grade I and 6 (6%) Grade II. In the Technical, 29 (26%) candidates received Grade I while 40 (36%) received Grade II. In that year, candidates who sat the General Proficiency examination showed a 1% improvement in performance, while those who sat the Technical Proficiency examination showed a 21% decline in performance. One of the factors that may have affected the results in 1994 was the dramatic rise in candidacy as described earlier. Once more, the peak of performance in the General Proficiency occurred at a failing grade. However, in 1993, the peak formed at Grade V, while in 1994 it occurred at Grade IV, an improvement of one grade point. In the Technical Proficiency examination, peak performance remained at Grade II, a passing grade.

Scientifically, the performance in the Technical Proficiency can be deduced to be undesirable. On examination of the raw scores (Table 3), a decline in performance is seen. However, to the unscientific mind, a Technical examination pass rate of 83% in 1994 seems better than the rate of 62% in 1993. Similarly, according to the raw scores presented in Table 2, the scientific mind would have applauded the 1% increase in candidate performance which occurred in that year. However, to the unscientific mind, a movement from 8 passes in 1993 to 9 passes in 1994 is not in any way significant.

Figure 5. General Proficiency 1995.

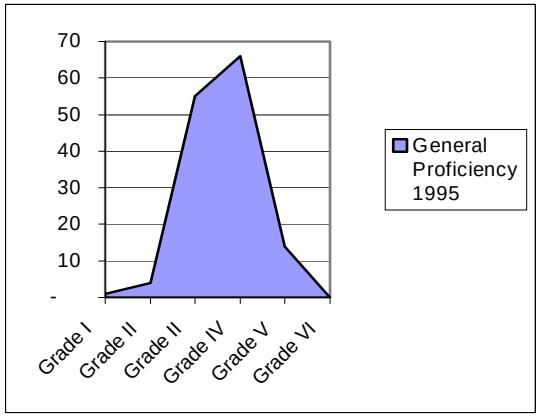
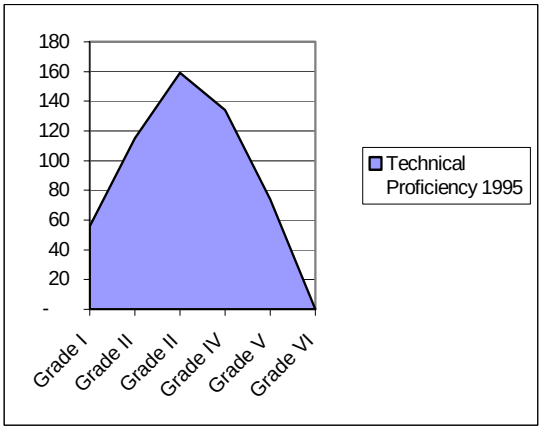


Figure 6. Technical Proficiency 1995.



In 1995, the balance continued to tilt towards entries at the Technical Proficiency level. A total of 678 candidates sat the IT examination and, of that number, only 21% sat the General Proficiency while 79% sat the Technical (Table1). Jamaica's performance continued to decline significantly. Figures 5 and 6 show that candidates earned only 1 (1%) Grade I and 4 (3%) Grade II in the General Proficiency. In the Technical Proficiency, 56 (10%) earned Grade I and 115 (21%) Grade II, a massive decline of 5% and 50% in the General and Technical scores respectively. For both examinations, the peak performance occurred at a failing grade. For the General Proficiency, it occurred at Grade IV (which was better than the years before), while for the Technical, it occurred at Grade III. That shows a decline in performance over the three years.

Figure 7. General Proficiency 1996.

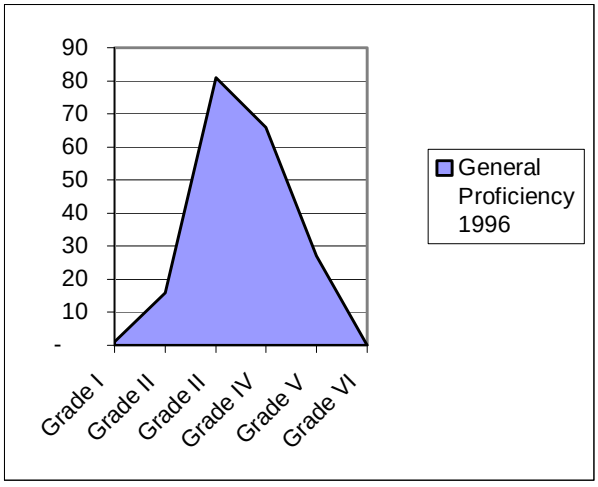
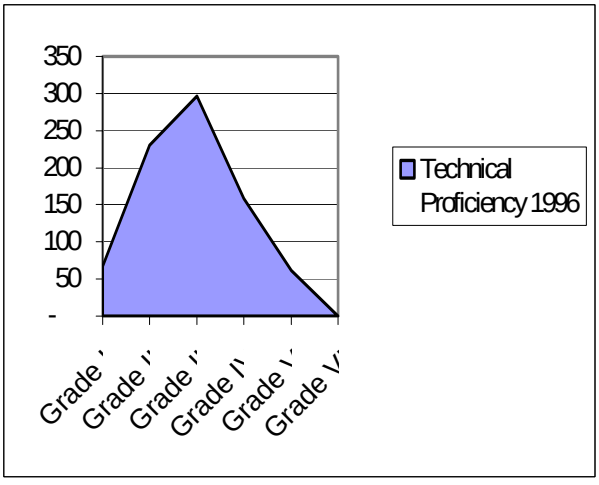


Figure 8. Technical Proficiency 1996.



The decline in performance in the Technical Proficiency examination was no deterrent for teachers in 1996. The fact was that more schools had managed to install computer laboratories by then, and the shortage of equipment and software was the excuse that was used to explain the poor performances of that year. The Ministry of Education intervened and ran several teacher training workshops, with the hope that

teaching methodology gaps could be improved. They also tried to standardise by requiring that all schools use a common application to prepare students for the Technical examination (Microsoft Work 4.0). Mass training in the use of software was undertaken, and continuous support was made available through the establishment of a computer teacher's network (a telephone list that assigned teachers to partners; they used this list when they needed help). This restored some amount of confidence to teachers and encouraged new schools to begin the task of preparing students for IT examinations. However, most of the new schools were encouraged to enter their candidates for the Technical Proficiency examination.

The total number of candidates who sat the examinations that year was 1,004 and, of that number, 19% sat the General Proficiency and 81% sat the Technical (see Table 1). Figures 7 and 8 show that in 1996, the General Proficiency candidates earned one (1%) Grade I and 16 (8%) Grade II. This showed a 9% improvement in passes earned on the General Proficiency when compared with 4% the year before, an increase of 5%. This was equally true for the Technical Proficiency, as 36% in 1996, when compared with 31% the previous year, showed a gain, an increase of 5%.

The trend towards the Technical Proficiency continued in 1996. Subsequently, in 1997, the candidacy figure almost doubled, totalling 1,444 candidates. Of that number, only 8% sat the General Proficiency while 92% sat the Technical Proficiency.

Figure 9. General Proficiency 1997.

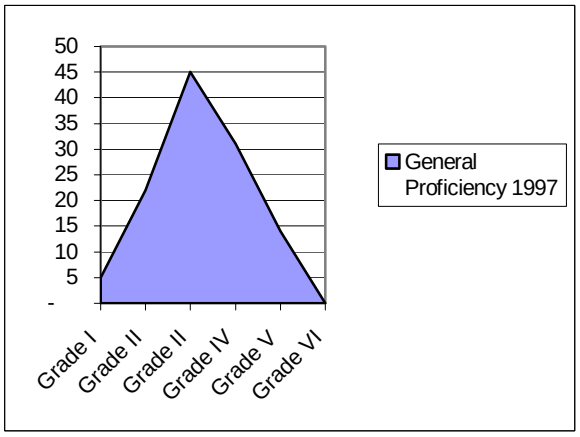
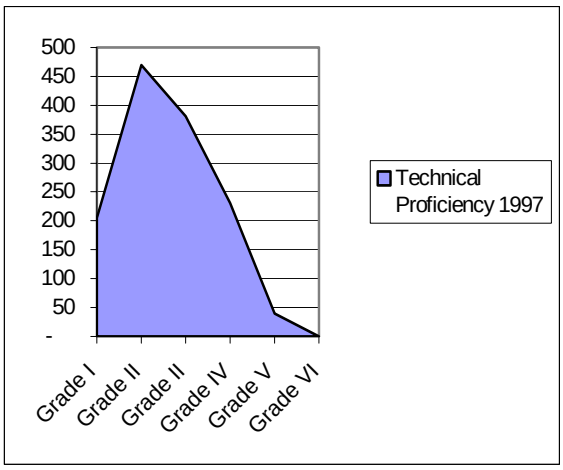


Figure 10. Technical Proficiency 1997.



The year 1997 was a defining year for the CXC IT examinations as the performances were satisfying. Both the General and Technical Proficiencies experienced a phenomenal change in results. Figures 9 and 10 show 27 candidates passing the General Proficiency examination: 5 (4%) Grade I and 22 (19%) Grade II. A total of 675 (51%) passed the Technical, with 205 (15%) Grade I and 470 (35%) Grade II. That year, the General sitting attained a 23% success rate while the Technical candidates attained a 50% success rate, a leap in performance for both when compared with the scores from the previous year. The performance in the General Proficiency represented a phenomenal leap as, for the first time in the history of the examination, Jamaica earned more than 20 passes, achieving an increase of 14% as against a 5% gain the previous year. For the second consecutive year, the peak performance in the General Proficiency occurred at Grade III. In the case of the Technical, the peak performance returned to Grade II, as in 1993 and 1994, after declining for two years.

The final year reviewed and analysed was 1998. In this monograph, 1998 is a landmark year, as it was in that year that CXC enacted its new policy decision; to expand the pass band and introduce Grade VI.

Figure 11. General Proficiency 1998.

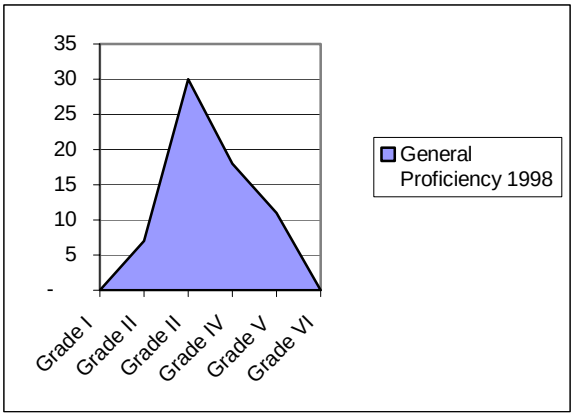
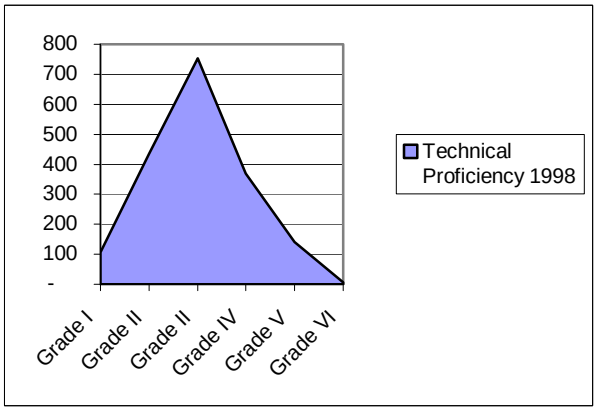


Figure 12. Technical Proficiency 1998.



This decision had a positive impact on the scores of candidates who sat both examinations. For example, in the General Proficiency, 66 candidates sat the examination and, for the first time in the examination's history, 37 (56%) earned passing grades: 0 (0%) earned Grade I, 7 (11%) Grade II, and 30 (45%) Grade III. In the case of the Technical candidates, of the 1,810 who sat the examination, 1,294 (72%) passed: 106 (6%) earned Grade I, 435 (24%) earned Grade II, and 763 (42%) earned Grade III. That year, the number of candidates who were entered for the General Proficiency examination represented the lowest in the history of the examination. Yet, the number of candidates who earned a passing grade was the highest that Jamaica had ever attained. Similarly, in the Technical Proficiency examination, there was a marked improvement in passes; those candidates achieved a total pass rate of 72%, the highest percentage pass Jamaica had received since 1993 when there was a pass rate of 83%. It should be noted that the peak of performance seen in Figures 11 and 12 both occurred at the Grade III level but, for the first time, the General Proficiency examination experienced a peak that was within the passing band.

Table 1. CXC Examinations - Number Of Jamaican Candidates Sitting Information Technology, 1993-1998

Year	Number Sitting General		Number Sitting Technical		Total Sitting
1993	**86**	79%	**23**	21%	**109**
1994	**86**	43%	**112**	57%	**198**
1995	**140**	21%	**538**	79%	**678**
1996	**191**	19%	**813**	81%	**1004**
1997	**117**	8%	**1327**	92%	**1444**
1998	**66**	3%	**1810**	97%	**1876**
Total	**686**	13%	**4623**	87%	**5309**

Source: Caribbean Examinations Council. *Report on Candidates' Work ..., 1993, 1994, 1995, 1996 , 1997, 1998a.*

Table 2. CXC Information Technology Examinations - Percentage of Jamaican Students Attaining Grades I, II, III, IV, V, and VI at the General Proficiency Level, 1993-1998

Year	I	II	III	IV	V	VI	TOTAL SITTING
1993	2% **2**	7% **6**	27% **23**	29% **25**	35% **30**	0 -	**86**
1994	3% **3**	7% **6**	28% **24**	42% **36**	20% **17**	0 -	**86**
1995	1% **1**	3% **4**	39% **55**	47% **66**	10% **14**	0 -	**140**
1996	1% **1**	8% **16**	42% **81**	35% **66**	14% **27**	0 -	**191**
1997	4% **5**	19% **22**	38% **45**	26% **31**	12% **14**	0 -	**117**
1998	0 -	11% **7**	45% **30**	27% **18**	17% **11**	0 -	**66**
Total Passes	2% **12**	9% **61**	38% **258**	35% **242**	16% **113**	0 -	**686**

*Note. T*he percentages used are based on the total number of candidates sitting, not the total entered.
Source: Caribbean Examinations Council. *Report on Candidates' Work ...1993, 1994, 1995, 1996 , 1997, 1998a.*

Table 3. CXC Information Technology Examinations - Percentage of Jamaican Students Attaining Grades I, II, III, IV, V and VI at the Technical Proficiency Level, 1993-1998

Year	I	II	III	IV	V	VI	TOTAL SITTING
1993	22% **5**	61% **14**	4% **1**	13% **3**	0 -	0 -	**23**
1994	26% **29**	35% **40**	27% **30**	10% **11**	2% **2**	0 -	**112**
1995	10% **56**	21% **115**	30 **159**	25% **134**	14% **74**	0 -	**538**
1996	8% **67**	28% **230**	36% **296**	19% **158**	8% **62**	0 -	**813**
1997	15% **205**	35% **470**	28% **381**	17% **231**	3% **40**	0 -	**1,327**
1998	6% **106**	24% **435**	42% **753**	42% **369**	20% **141**	.003% **6**	**1,810**
TOTAL PASSES	10% **468**	28% **1,304**	35% **1,620**	20% **906**	7% **319**	.001% **6**	**4,623**

Note. The percentages used are based on the total number of candidates sitting, not the total entered.
Source: Caribbean Examinations Council. *Report on Candidates' Work ... 1993, 1994, 1995, 1996 , 1997, 1998a.*

There are several issues emerging from the data which will require further discussion. For example:

1) *In the General Proficiency:*

- Between 1994 to 1996, the results differed only slightly from year to year, as can be seen from comparison with the 1993 figures.
- The examination results in 1997 (37 passes) represented a leap in performance, as this was on the basis of the old grading scale.
- The performance in the examination showed continuous improvements over the six years, peaking in 1998 with a 56% pass.

2) *In the Technical Proficiency:*

- The subsequent increase in candidacy seen in the Technical Proficiency suggests that this examination is more popular among candidates. Bearing in mind that not all school leavers will pursue further study, the data presented raise some concern, as Jamaica's performance is skewed towards the Technical Proficiency. This examination, as discussed earlier, was designed to produce skilled graduates who are equipped for the world of work and vocational courses. This suggests that only 13% of candidates are being prepared for higher learning in the field of IT, bearing in mind that, of that 686, only 103 (15%) earned a passing grade over the six-year period.
- The performance curve of the results is much more desirable because peak performance occurred at a passing grade four times over the six years.

The performances noted in the foregoing examples represent good indicators of progress. The technical indicators are more in keeping with the goals of basic education that Jamaica has set towards

achieving a computer literate school-leaving population. However, on the negative side, it does not indicate a strong balance between preparation for employment and higher learning. A number of implications come with this imbalance which can be useful to EFA's assessment of progress. These will be discussed in further detail.

Implications of the Results

In the introductory section of this monograph, it was stated that Caribbean Ministers of Education had set the following goal as a priority: "increased access to IT to schools" (UNESCO, 1999). The CXC data for Jamaica (presented in Tables 1, 2, and 3) suggest increased access to IT tools. The provision of an examination has guaranteed students equal access to generic computing skills that are of value to the world of work. The CSEC in IT fosters regional identity through shared experiences. This is important, but a certification that serves to provide skills for employment is of no use to students who wish to pursue tertiary training in universities across the region and in the wider world. Earlier, the aims of each component of the CXC IT examination was discussed. Briefly, the Technical Proficiency was designed to meet employment needs, and the General Proficiency to meet tertiary training needs. Therefore, it is problematic that, between 1993 and 1998, 5,309 Jamaican candidates sat the CXC IT examinations and only 103 (15%) of them earned a passing grade in the general proficiency examination. This means that only 2% of high school graduates who earned passing grades in IT between 1993 and 1998 were equipped to pursue tertiary training in IT or computer science. Since 2,525 high school graduates received passes at the Technical Proficiency examination over the six years, it means that 48% were prepared for the world of work. It is, therefore, safe to conclude that 50% of the total candidates who sat the CXC IT examination over the six years analysed failed to meet the passing goal.

Perhaps, this contributes to the failure of the Mona Campus of UWI to include a pass in IT as a compulsory entry requirement. Through enquiries made in the Department of Mathematics and Computer Science, it was discovered that the Department makes an assumption that all entrants to that major have no previous training in computer science. Therefore, all basic programming skills that should have been acquired through exposure to an organised secondary training programmes are included in the degree. Hence, first year students are required to complete six credits of basic programming. They achieve this by pursuing two introductory computer science courses (Introduction to Computer Science I and II) which are designed to fill the skills and knowledge gaps.

These introductory courses have proven to be a challenge to entrants, as they have to take these courses along with other university courses and, very often, they are not able to achieve success on their first attempt. According to UWI's annual *Departmental Report* (1993/94), the Computer Science Department reported that 154 students undertook studies in the "Introduction to Computer Science, Level I" course, of whom 85 passed. Of that number, only 55 students attained A grades. A similar trend was noted in the "Introduction to Computer Science, Level II" course: 121 students sat the examination and 65 passed. Of that number, 54 A grades were recorded (UWI, 1994). The following academic year 1994/1995, 152 computer science majors undertook studies in the "Introduction to Computer Science, Level I" course: 94 passed and only 13 received A grades. In the "Introduction to Computer Science, Level II" course, 128 undertook studies in the course and only 57 passed; that year, none of the students received A grades (UWI, 1995) (see Table 4 for more details). This performance is in keeping with the decline in performance of candidates who sat the CXC in that year (see Tables 2 and 3).

Table 4. Department of Computer Science, UWI, Mona - Performance Report for Introduction to Computer Science I & II – 1993/94 – 1994/95

Year	Level	Number of Students	Passes	# of As
1993/94	I	154	85 55%	55 66%
1993/94	II	121	65 45%	54 83%
1994/95	I	152	94 62%	13 9%
1994/95	II	128	57 45%	0 -

Source: The University of the West Indies, Mona. *Departmental Reports 1993/94; 1994/1995.*

A Curriculum Officer from Jamaica's Ministry of Education indicated, in an interview, that one of the greatest difficulties in the teaching of IT was the inability to attract trained teachers. A survey which was carried out by the Ministry in 1996 revealed that 90% of the IT teaching pool was either untrained or trained in another discipline (MOE. Core Curriculum Unit, 1996). This situation needs immediate attention. It is no wonder that Jamaica has displayed a bias towards the Technical Proficiency examination, as its content and requirements would be more accommodating of self-training than the General Proficiency, which has a strong problem solving and programming requirement. It is pleasing to note that 1995 saw the first group of 14 trained teachers graduating from two teachers' colleges with double majors in Computer Studies. Between 1992 and 1997, the University of Technology produced a total of 1007 Computer Studies graduates: 195 (19%) degrees, 528 (53%) with teachers' college diplomas, and 284 (28%) with accredited certificates (see Table 5 for further details). Trained teachers in this group account for only 45% of the graduates. This, perhaps, helps to explain Jamaica's heavy leaning towards the Technical Proficiency.

Table 5. Department of Computer Science, University of Technology - Graduates Awarded Degrees, Diplomas, and Certificates, 1993-1995

Year	B.Sc.	Associate Degrees	Diplomas	Certificates
1992/93	50	-	69	51
1993/94	25	-	75	34
1994/95	26	-	77	34
1995/96	31	-	43	23
1996/97	63	-	264	142
1992-1997	195	0	528	284

Source: Jamaica. Ministry of Education, Youth and Culture. *Education Statistics 1992-1997.*

The issues that arose from the data analysis and the implications suggested must not to be ignored. Jamaica has made great strides, and has solved some of the problems which surround access to basic IT tools. However, having done so, the country must pause at this point to evaluate its achievements and ask these questions:

1. Has the Jamaican system been able to train teachers adequately to meet the level of delivery required by Caribbean Ministers' goal for basic education?
2. Has Jamaica focussed enough on the level of skills training that it wants to attain, to ensure that there is a balance between those who are trained to earn as against those who are trained to continue to learn?
3. Is it practical to recommend that school leavers who leave school with Technical Proficiency passes be given matriculation status into higher degree programmes that are IT- or computer science-based?

Recommendations

Having analysed the data, explained factors, and presented the possible implications, it is recommended that stakeholders consider the following:

1. All education institutions must be equipped to produce teachers who are trained in the requisite teaching methodologies, principles, and philosophies, complemented by relevant IT content.

2. An effort must be made to bring university graduates working as teachers up to trained teacher status, so that they will receive the salary of trained graduates.

3. A common curriculum must be written for secondary schools. This must introduce IT as a subject from Grade 7, culminating at Grade 9 with the sitting of the CXC Technical Proficiency examination or a parallel examination administered internally.

4. A rigid set of standards for teaching CXC IT must be developed and enforced. This would require that only teachers who have received a credit diploma in IT be allowed to prepare students to sit the Technical Proficiency examination. Only honours diploma graduates and degree-holding trained teachers should qualify to prepare students to sit the General Proficiency examination. Further, only graduates who have earned a minimum of second class honours should prepare students to sit CAPE.

5. Institutions of higher learning, especially degree-granting ones, must insist that candidates who are eligible for entry must have passed both the General and the Technical Proficiency examinations. The pass in the Technical Proficiency examination would equip candidates to use applications to enhance the quality of their study, while the General Proficiency requirement would guarantee that entrants come in with basic prerequisite skills that would enable them to adequately cope with the quest for further knowledge and profound understanding. These institutions could accept a Grade I at the Technical level and Grades I and II at the General level.

6. A tracer study should be done of high school graduates who have matriculated for higher degrees in Computer Science who are recipients of Technical Proficiency passes in IT. It is suspected that this study would reveal that a high percentage of these students either failed programming courses the first time or received very low passing grades.

7. The institutionalisation of IT in primary schools, through the development of a specific curriculum for use with Grades, 4, 5, and 6 should be considered.

The CXC IT examinations are rigorous assessment tools, designed to challenge candidates' knowledge and to substantiate learning. It is important that Jamaica seeks to balance its attainment. Teachers have a responsibility not only to prepare school leavers for work, but also to make provisions that would qualify them to pursue tertiary training. It is also true that higher scores would lead to better preparation for higher education which, in turn, leads to acceptance to better higher learning programmes. Success in better programmes would lead to better career opportunities and options. Whatever the scenario, the Caribbean, through the CXC, must help graduates to achieve higher scores and to qualify at the highest level possible. In this technological age, developing countries must be no different from developed countries, as technology will create a bridge between nations, making available a vast amount of information and resources. Quality yields can only lead to greater successes.

This monograph sought to bring to the fore issues that are now relevant to the future of Jamaican citizens. It discussed a decade of initiatives that drew Jamaica nearer to its goal; providing basic computer skills for all. These initiatives have influenced employment, productivity and, to a lesser extent, higher education. The monograph also raised questions that are important to EFA and discussed issues that could inform the next dimension of EFA.

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