THE UNIVERSITY OF THE WEST INDIES

ST. AUGUSTINE

TRINIDAD

FACULTY OF HUMANITIES AND EDUCATION

SCHOOL OF EDUCATION

MASTER OF EDUCATION

(CURRICULUM)

ED 690 -- RESEARCH PAPER

TITLE:

AN EVALUATION OF THE IMPLEMENTATION OF THE TECHNOLOGY EDUCATION CURRICULUM AT TWO SECONDARY SCHOOLS IN CENTRAL TRINIDAD

SUPERVISOR: DR. S. M. YALAMS

STUDENT: BABSY KIDNEY

DATE: 30TH JUNE 2009.

AN EVALUATION OF THE IMPLEMENTATION OF THE TECHNOLOGY EDUCATION CURRICULUM AT TWO SECONDARY SCHOOLS IN CENTRAL TRINIDAD

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Education – Curriculum

of

The University of the West Indies

Babsy Kidney

2009

School of Education

Faculty of Humanities and Education

St. Augustine Campus

An evaluation of the implementation of the Technology Education curriculum at two secondary schools in Central Trinidad.

ABSTRACT

This research investigated the implementation of Technology Education at two secondary schools in central Trinidad. Three research questions guided the study. A case study method employing qualitative design was used to conduct the research. The sample consisted of six participants (two principals and four Technical/Vocational teachers who were supposed to be presently involved in teaching Technology Education). Face to face interview using audiotapes were used as the main instrument of data collection. For the analysis, data collected were reduced through the means of colour coding and by finding themes. Findings of the study showed that not much progress had been made in the implementation process at these two schools despite efforts to ensure a smooth and successful implementation by the Ministry of Education. Furthermore, the result identified that no significant measures were witnessed in the two schools as efforts towards the implementation. Some inhibitors to the implementation of the new educational system in the two schools identified by the study included lack of resources and proper training of teachers for the take off. The study did not warrant generalization, but proffered a recommendation that an in depth study be conducted covering a wider scope of schools that are supposed to be running the new Technology Education as expected in the country.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr. S. M. Yalams for his valuable contributions and guidance, throughout this project. I would also like to thank the participants who were willing to share their knowledge and experiences so that this project could become a reality.

My gratitude also goes to my husband and children for their unstinting support and patience throughout this entire project. My greatest thanks go to the Almighty God who is my tower of strength.

THE UNIVERSITY OF THE WEST INDIES
ST. AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES
FACULTY OF HUMANITIES AND EDUCATION
SCHOOL OF EDUCATION
Telephone: (868) 662-2002 Ext. 83336 Fax: (868) 662-6615 e-mail: Lynda.Quamina-Aiyejina@sta.uwi.edu

RE: School of Education Collection in UWISpace

Dear Past Student Babsy Kidney.

Your M.Ed. Research project has been selected for deposit in UWISpace, an archive that was established by the UWI Libraries to provide access to the digitally preserved intellectual output of the university. It aims to collect together in one place the research and scholarship of the UWI community.

The School of Education (SOE) has a community in UWISpace, which consists of three collections: Staff Research, Student Research, and Administrative Documents. With your permission, your project will be deposited in the Student Research Collection. You will be required to sign and return the attached Deposit Agreement to the SOE, and to provide us with an electronic copy of the final version of your project report, preferably in PDF format. If you are unable to provide a PDF version, you may send a version in Microsoft Word.

Please send the electronic copy to: Lynda.Quamina-Aiyejina@sta.uwi.edu

Mail or bring in the signed form to: Ms. Rena Sookdeo, School of Education, UWI, St. Augustine.

We thank you for your support of this initiative.

Lynda Quamina-Aiyejina
Indexer/Documentalist (Senior Librarian II)
Caribbean Educational Research Information Service (CERIS)
Tel: (868) 662-2002, Ext. 83336
Fax: (868) 662-6615

TABLE OF CONTENTS

LIST OF APPENDICES

Chapter One

Research Topic

Introduction

1.1 Background of the study

The school curriculum is dynamic and as such keeps changing to meet the needs of the key stakeholders at any given time. Global developments in technology and science are making nations rethink their overall national objectives, thereby reforming educational policies leading to curriculum changes and enactments.

In Trinidad and Tobago, the Technical and Vocational Education and Training (TVET) has been operational in the secondary schools as one of the subject areas for decades until recently when the government, in its efforts towards moving the country forward from "developing" to a "developed" nation's status by the year 2020 (Vision 2020, Operational Plan 2007-2010, Section 1 p.24), a modification of the secondary education curriculum was deemed necessary.

A special program known as the Secondary Education Modernization Program (SEMP) was formalized and implemented over a seven year period, from October 1999 to September 2000 and was charged with the task of "undertaking a comprehensive overhaul of the country's secondary education system with the ultimate aim of producing citizens with the skills and attitudes to cope successfully with the rapidly unfolding challenges of today's world" (SEMP: Secondary Education Modernization

Programme. Providing Quality Secondary Education For All). One of the newest and most innovative changes in this entire modernization initiative was the introduction of Technology Education in the curriculum of all secondary schools in Trinidad and Tobago.This new curriculum was intended to gradually phase out the TVET courses such as Industrial Arts, Home Economics and Agricultural Science from the lower secondary schools (forms 1-3). This phase-out was expected to be completed before December 2006 (Vision 2020, Operational Plan 2007-2010, Section 1 p31).

Technology Education by definition is the study of technology, which provides an opportunity for students to learn about processes and knowledge related to technology.

As a study, it covers the human ability to shape and change the physical world to meet needs by manipulating materials and tools with techniques.

As education, the goal is to teach the knowledge and techniques to develop technological literacy which is accomplished by bringing laboratory activities to students.

(http:// en.wikipedia.org/wiki/Technology _education.)

Technology Education by its philosophy is aimed at introducing learners to the various strands or clusters of technologies that move the world. According to the International Technology Education Association (ITEA, 2000), Technology Education includes a variety of courses designed to teach creative and critical thinking, modeling and prototyping

skills, measurement, analytical reasoning, design, troubleshooting, teamwork skills, and problem solving abilities. Basically, it is the study of the tools, materials, and the processes necessary to design and to problem solve.

(http://www.technologyeducation.org/topicoftheday/whatistechnologyeducation.htm).

Furthermore, the goal of Technology Education as stated in the Standards for Technological Literacy, content for the study of Technology (ITEA, 2000) is to produce students with a conceptual understanding of technology and its place in society, who can thus grasp and evaluate new bits of technology that they may never have seen before (ITEA, 2000 p. 4). Technology teachers or educators therefore, are not expected to just teach learners how to use tools, but how to use tools to solve problems. For instance in a computer aided drafting class, students are not just expected to be taught how to use the CADD software, but also how to use the concepts of design to create solutions to particular societal problems. Generally, the sub-components of Technology Education include Energy, Power and Transportation, Communication, Construction, Manufacturing/Production and Medical and Biotechnologies (ITEA, 2000). The Government of Trinidad and Tobago had embarked on a number of measures to ensure that Technology Education took off the ground successfully. One such measure was securing a loan from the Inter-American Development Bank (IDB) for funding the programme (Technology Education Curriculum, 2002 p. 1-1). Another measure was the training of teachers in 2000 (The August Institute 2000) by an International Consultant

from the Mount Saint Vincent University, Department of Education, Nova Scotia, Canada. At a second training programme, approximately one hundred and twenty teachers were trained and awarded a Diploma in Technology Education. Twenty two other persons from the Ministry of Education were also trained in a Train-the Trainer program and these trainers were supposed to train the other 'untrained' teachers later on.

Another major effort was the building and furnishing of technology laboratories in ten pilot schools with the hope that another nine would be built and furnished. (SEMP: Secondary Education Modernization Programme. Providing Quality Education For All p.10).

Over this period much was expected to have been achieved in terms of moving the newly introduced Technology Education subject forward in the country. An evaluation of the progress in this direction would be an issue of major interest to the education stakeholders. Unfortunately such qualitative and quantitative data were limited.

1.2 Statement of the Problem

Despite all the efforts by the Ministry of Education in order to ensure a smooth and successful implementation of Technology Education at the secondary school level in the country, it seemed that not much progress appeared to have been made. Preliminary investigations of the situation revealed that in some of the schools there were serious

problems ranging from inadequate preparation of teachers to lack of practical facilities for teaching the subject. Technology Education being a facility dependent subject if conducted without the relevant facilities and materials may not be able to achieve its desired objectives (Subran, 1994 and ITEA 2000) (APPENDIX A). Furthermore, in some schools where trained teachers were available, the implementation of the subject was often ignored or suppressed by the affected schools' administrators possibly for what may be considered as "share ignorance" of the subject.

The prevailing situation therefore raised issues of serious concerns especially with regards to the level of preparedness of the schools for implementing the new subject as a core course. One was therefore compelled to ask some pertinent questions: Was it that the Stakeholders' vision of implementing Technology Education in all the secondary schools in the country was dimming out as against the immense interest and excitement when, it started a few years ago? Or still more, that the new subject was no longer relevant in the educational development and agenda of the country? Were the stakeholders conscious of the implications of such a gross neglect of Technology Education in the country? Whatever may have been responsible for this seemingly negative development, the situation called for empirical investigation. Certainly, this country cannot fully achieve its much desired vision 2020 when "blind eyes" continued to be turned at such an aspect of education that promised much in terms of technological development for this and future generations. The main focus of this study

therefore was to address these and similar questions.

1.3 Justification of the study

Technology Education was introduced as a SEMP initiative for nearly five years yet, there had been no evaluation or analysis of any kind on the implementation of this curriculum. Thus, this study intended to formally and empirically investigate the success or failure of the implementation of the Technology Education curriculum at two secondary schools in this country.

Findings of the study unearthed and presented the stakeholders' views, perceptions, feelings and their attitudes about the subject being taught in those schools after nearly five years of the initial take off. Furthermore, it would specifically be interesting to discover or identify some of the problems, shortcomings, as well as the positive attributes of this innovation in the secondary school's curriculum of the two schools in this study. This study was worthy of investigation because it hoped to provide valuable data to the Ministry of Education and other stakeholders on the progress of the Technology Education curriculum generally in the country and specifically in the affected schools to be investigated. Insights gained and presented may help guide future curricular planners and policy makers when implementing other curricula.

1.4 The Purpose of the Study

The purpose of this case study was to explore the extent to which Technology Education had been implemented in these two secondary schools and whether it had met its goals and objectives. It also sought to determine whether the measures that were put in place by the government were adequate in order to ensure implementation and sustainability of the programme.

The researcher also sought to obtain information about the availability and adequacy of the resources and facilities needed to implement and sustain Technology Education at those secondary schools. Furthermore, this study proposed to gain insights on the success or failure of this curriculum Innovation, judging from the schools to be studied.

1.5 Research Questions

The following questions guided the study:

1. How has the Technology Education curriculum been implemented in this school?
2. Are the measures put in place by the Ministry of Education adequate for implementation of the Technology Education curriculum?
3. What are/were the inhibitors, (if any) of this curriculum change?

1.6 Definition of Terms

The following definition of terms was identified as applied in this study:

Implementation

Implementation of the Technology Education program in this context means putting into practice the teaching, learning and assessment strategies as outlined in the Technology Education Curriculum.

Evaluation of implementation

Evaluation of implementation is the making of value judgments of a curriculum that has been implemented, to discover if it is producing the desired results (Lunnenburg & Ornstein, 2004).

Innovation

In this study, innovation means the change of those practices and set of activities of the Technical/Vocational subject areas, to those areas prescribed in the Technology Education curriculum.

1.7 Significance of the study

- There is a lack of data on the implementation of Technology Education and this study provided some feedback as to the extent to which this subject has met its intended goals and objectives at these two schools in this study.

- The research findings and conclusions might serve as a springboard from which other action can be taken to review and improve the Technology Education curriculum.
- This investigation aimed to identify some of the shortcomings and deficiencies of implementing Technology Education.
- This study could serve as a guide for curriculum developers in other subject areas when planning for curriculum implementation and enactment.

Chapter Two

Literature Review.

This chapter presented review of related literature to the study under the following sub-headings:

2.1 Introduction

2.2 Curriculum and Philosophical Underpinnings of Technology Education

2.3 The Vision, Rationale, Goals and Objectives of the Technology Education Curriculum in Trinidad and Tobago

2.4 Technological Literacy, Teaching, Learning and Assessment Strategies of Technology Education

2.5 Curriculum Implementation, factors affecting it and the barriers impeding the implementation

2.6 The Principal as a facilitator of change and the Teachers' Roles and Perceptions on Change

2.7 The Concerns Based Adoption Model (CBAM) and the Stages of Concern

2.8 The Evaluation of Curriculum Innovations

2.9 Summary of the Literature Reviewed

2.2 Curriculum and Philosophical Underpinnings of Technology Education

The Technology Education curriculum is a written document that adopts Macdonald's Curriculum Model (Technology Education Curriculum 2002 p.1-2). This Model establishes the basic force that influence and shape the organization and content of this curriculum.

These are:

a. The Philosophy and the Nature of Knowledge

b. The Learner

c. Learning Theories.

These foundations are essential to the development of a coherent, culturally focused and dynamically evolving curriculum. The prevailing philosophical concerns and educational goals provide the base of this curriculum and are stated in the Education Policy Paper 1993-2003. This philosophy undergirds the equality of opportunity as portrayed by the basic human rights of all children, of an education which will enhance the development of their maximum capability regardless of gender, ethnic, economic, social or religious background. The premise is that all children, even of varying ability levels are capable of developing numeracy, literacy, scientific and technological skills to

become lifelong learners. The educational opportunities provided also enhance democratic living as the students develop honesty, tolerance, integrity, mutual respect and respect for human reasoning. In that process, students will also develop spiritually, morally, ethically, emotionally, intellectually and personally.

The Technology Education curriculum displays a learner-centered design. It is based primarily on a 'man-centered' philosophical assumption employing the constructivist theory. Its major orientation is to curriculum as self-actualization. It is student-centered as it seeks to provide personally satisfying experiences for the student and is growth oriented. It has its roots in Pragmatism, which construes knowledge as a process in which reality is constantly changing. The student of Technology Education engages in problem solving which is transferable to a wide variety of subjects and situations. Knowing is considered a transaction between the learner and the environment. Basic to this interaction is the idea of change. To the pragmatist, nothing can be viewed intelligently except in relation to a pattern where the whole and its parts are relative to each other. The philosophy of this subject holds the view that the learner is expected to think critically which, to the pragmatist, is more important than teaching the learner what to think. Pragmatism and Technology Education both view teaching as more exploratory than explanatory (Ornstein & Hunkins, 2009 p. 36).

Progressivism, also has as its philosophy, child-centered, activity centered, creativity, experiences, problem solving and the project method as basic tenets.

Technology Education is bounded by the various philosophies of constructivism, pragmatism and progressivism.

2.3 The Vision, Rationale, Goals and Objectives of the Technology Education Curriculum in Trinidad and Tobago

The Vision

The vision of Technology Education for Trinidad and Tobago (Technology Education Curriculum, 2002) is to produce students, who are technologically literate, creative, innovative and effective communicators. These students will function as competent, productive citizens responsive to a technologically changing society p.2-1.

The Rationale

The Ministry of Education, through the modernization and expansion of the education system, and the recognition of the rapid changes in technology that identify the Fourth Wave of human experiences had decided to introduce Technology Education in all secondary schools in Trinidad and Tobago. (Technology Education Curriculum, 2002 p.2-3).

This curriculum innovation will empower students with knowledge, skills, attitudes and an understanding of all aspects of technology to live, learn and work successfully in an increasingly complex and information driven market economy and society.

Technology Education is an inclusive curriculum which will cater for the students of varying abilities, aptitudes and interests and will help all students to become more creative and adaptable, to use critical thinking skills, and to learn how to learn. It will provide all students with values and attitudes necessary to cope in the dynamic, global environment and equip them with a foundation to advance to a higher level of education and training.

Additionally, Technology Education will enable all students to communicate effectively – understanding not only how media works but how it can be applied in the use and abuse of information. These students will learn in an environment that demands cooperation, collaboration and high levels of interpersonal skills and to conduct themselves in ethically and morally responsible ways.

Finally, Technology Education is critical to addressing many of the problems of under-development of the economic and human resources of Trinidad and Tobago. This curriculum has been designed to provide students with practical, hands-on experiences in four strands: Production, Communication, Biotechnology and Energy, Power and Transportation – key pillars of a well-articulated twenty first century economy (Technology Education Curriculum, 2002 p. 2-1).

Goals and Objectives of the Technology Education Curriculum in Trinidad and Tobago

The main goals and objectives that this curriculum must facilitate is that all students must achieve six essential learning outcomes in the areas of:

- Aesthetic expression
- Citizenship
- Communication
- Personal development
- Problem solving
- Technological Competence

The general intended learning outcomes of the Technology Education Curriculum are:

Students will:

1. Acquire and demonstrate knowledge and understanding of the principles, processes and products of technology.
2. Research, identify and evaluate information to solve problems related to the design and construction of systems and products of technology education.
3. Develop responsibility for, and an understanding of the impact and

consequences of the application of technology.

4. Develop sensitivity to value issues in technology and its relationship to human society.

5. Develop attitudes and abilities of efficient producers and/or consumers of technological goods and services.

6. Evaluate the products and systems in technology for functional use, economy and efficiency.

7. Develop products to reflect the cultural aspects of our society using indigenous resources.

(Technology Education Curriculum 2002, p. 2-5).

2.4 Technological Literacy, Teaching, Learning and Assessment Strategies of Technology Education

Technological Literacy, according to the International Technology Education Association (ITEA) 2000, is the ability to use, manage, assess and understand technology. The characteristics demonstrated in a technological literate person is that he is able to understand the major technological concepts behind current issues and appreciate the importance of fundamental technological developments. He is skilled in the safe use of

technological processes that may be pre-requisites for their careers, health or enjoyment.

Some of these characteristics that should be seen in such an individual are:

- They are problem solvers who consider technological issues from different points of view and relate them to a variety of contexts.
- They understand technological impacts and consequences, acknowledging that solutions often involve tradeoffs, accepting less of one quality in order to gain more of the other.
- They use a strong systems-oriented, creative and productive approach to thinking about and solving technological problems.
- They use concepts from science, mathematics, social studies and language arts and other content areas as tools for understanding and managing technological systems.
- They appreciate the interrelationships between technology and individuals, society, and the environment.
- They understand that technology is the result of human activity or innovation.

Technological literacy must meet the Technology Content Standards as prescribed by the ITEA, 2000. These standards is defined as what students should show and be able to do in order to be technologically literate and provides standards that prescribe what the outcomes of the study of technology in a particular grade should be (Journal of Technology Education, 2007).

Some Professional Development Standards advanced by the ITEA are that professional development providers should consistently prepare teachers to:

- Understand the nature of technology
- Recognize the relationship between technology and society
- Know the attributes of design
- Develop abilities for a technological world
- Develop proficiency in the designed world.

Some Professional Standards for Teachers are:

- Assure that the program incorporates suitable cognitive, psychomotor and affective learning elements
- Create and manage learning environments that are supportive of student interactions and student abilities to question, inquire, design, invent and

innovate

- Create and innovate environments that are up-to-date and adaptable
- Implement a written comprehensive safety program
- Promote student development of knowledge and abilities that provides for safe applications of appropriate technological tools, machines, materials and processes.

Some Student Assessment Standards geared towards excellence in Technological Literacy are:

- Incorporation of technological problem solving
- Inclusion of a variety of technological content and performance-based methods
- The facilitation of critical thinking and decision making in the process
- The accommodation for modification to student assessment
- The utilization of authentic assessment.

Technological literacy is important because we live in a technological world and therefore are required to perform at a higher level than the basic ability to read, write and do simple mathematical tasks.

Technological literacy should not be left for individuals to gain through daily activities or by chance but the school should bear the bulk of training because the educational system can provide the most comprehensive study of technology.

http://www.iteaconnect.org/TAA/PDFs/AETLExecutivesummary.

Teaching, Learning and Assessment Strategies of the Technology Education Curriculum

The teaching strategies will engender in students the ability to think critically and engage in problem-solving. They will integrate the learning abilities of the student to use all their intelligences . The teaching/learning environment will be engineered to allow students to use self-directed learning and to develop skills in experimentation, research, group activity, demonstration, interpersonal and human relations and communication skills.

The proposed range of methodologies include problem solving and technological methods, power-point presentations, experimentation, model building, case study analysis, portfolio, software applications such as AUTOCAD, Corel Draw and Microsoft Word.

The implementation of this curriculum should involve constant co-operation among teachers, curriculum officers, school supervisors and technology education support

staff. Students' assessments will be based on the achievement of specific learning outcomes.

These include their ability to:-

- Engage in authentic and multi-disciplinary tasks
- Perform real tasks
- Participate in interactive modes of instruction
- Work collaboratively
- Work in heterogeneous groups
- Learn through exploration

Some examples of the above are to solve problems, compose a poem, write an essay, draw a map, use tools, write reports, investigate, give written and oral presentations, design portfolio, produce journals and have exhibitions.

Alternative assessments stress the importance of examining the processes as well as the products of learning. The content, teaching, learning and assessment strategies are the means through which curriculum goals will be achieved.

2.5 Curriculum Implementation, factors affecting it and the barriers

Impeding the implementation

Fullan (2001), remarked that "implementation consists of the process of putting into practice an idea, program, or set of activities and structures new to the people attempting or expected to change" (p. 69). Rogers (2003) said that "implementation occurs when an individual (or other decision-making unit) puts a new idea into use" (p. 169). Implementation can be described as the point at which the change is actually realized in the classroom. It is an interaction process between those who have designed or created the program and those who are asked to deliver it. Implementation attempts to alter an individual's knowledge, actions and attitudes.

For successful implementation to occur or enactment to emerge, the behaviors of all involved must be addressed. The curriculum designers and developers, curriculum officers, administrators, teachers of Technology Education and all those involved must be clear about the purpose or intent, the nature and the real and potential benefits of the innovation.

Leslie Bishop stated that implementation requires restructuring and replacement

(Ornstein & Hunkins, 2009, p.250). It requires adjusting personal habits, ways of behaving, program emphases, learning spaces and existing curricula and schedules. This means getting education to shift from the current program. In this study, it means moving away from the teaching, learning and assessment strategies of Industrial Arts, Agricultural Science and Home Economics of the Technical/Vocational area to the unique practices of Technology Education.

The planners and implementers of Technology Education must have basic understandings of how it affects organizational change and how the ideas fit into the real world of the student including the social and cultural contexts.

Seymour Sarason as cited in Ornstein & Hunkins (2009), noted that two kinds of basic understandings are essential to implementation. The first understanding is that one must have an understanding of organizational change and how the information and ideas fit into a real-world context. The second understanding is the relationship between the curriculum and the social-institutional contexts.

Successful implementation of the Technology Education curriculum needs to comprehend the structure of the organization and what traditions are held sacred and the power relationships and how the implementers define themselves and their roles.

Another factor of implementation and its success is careful planning. This addresses the needs and resources requisite for carrying out intended actions. Planning should focus on the people, programs and processes. Well conceived curriculum innovations, sometimes receive poor responses from various stakeholders because not much significance was placed on the implementation process during the planning stage, it is stated that those responsible for curriculum do not possess a macro-view of the process – from design to institutionalization.

Curriculum creators must realize that implementation is an interaction between those who have designed or created the program and those who are asked to deliver it. Individuals often think that implementation is a "clear cut yes or no process; one either uses the new program or does not" (Ornstein & Hunkins, 2004 p. 298).

Mathew Miles and Karen Louis (Ornstein & Hunkins, 1998) stated that there must be vision building so that those who are to deliver the innovation are passionate about it and have similar images of the innovation as all personnel involved – especially the teachers – need to be committed to the new program and must develop enthusiasm for it.

Doll (1996) indicated that several categories of persons are involved in a given curricular change, some are likely to support the change, others to resist it and still others to be lukewarm about it p.321.

Fullan and Pomfret noted that:

> "Effective implementation of ----------innovations requires time, personal interaction and contacts, in-service training and other forms of people based support. Research has shown time and again that there is no substitution for the primary of personal contact among implementers and between implementers and planners/consultants, if the difficult process of unlearning old roles and learning

new ones is to occur" (Ornstein & Hunkins, 1998 p.293).

Factors affecting Implementation

Factors that do not support implementation form a set of variables that interact overtime to determine success or failure.Many attempts at policy and program change have concentrated on product development, legislation and other on-paper changes in a way that ignores the fact that the people who are involved – the teachers and the students - are crucial variables.

Michael Fullan (2001) discussed some key factors or variables that affect implementation.

One factor or variable that is often overlooked is a lack of understanding of the characteristics of the innovation. Ornstein & Hunkins (2009), expressed the view that "people who wish to implement the new curriculum need to understand the characteristic of the change being considered" (p.263). They also found that people will resist an innovation because the need for change is not made known, or if made known, not accepted by those who are to be affected by the change. Fullan (2001) added that many innovations are attempted without careful examination as to whether or not they address what are perceived to be priority needs – "teachers frequently do not see the need for an advocated change" p. 75. He further stated however that although needs are unclear at the beginning when the process of implementation begins and people start doing things then needs become clearer p.78. Another factor that influences

curriculum implementation is the 'clarity of goals' of the implementation. Even when there is an agreement that change is needed, the implementers are not clear about what they should do differently. Research showed the "more complex the reform the greater the problem of clarity" (Fullan, 2001 p.77). In short, lack of clarity - diffuse goals and unspecified means of implementation – represent a major problem at the implementation stage; teachers and others find the change is simply not very clear as to what it means in practice (Fullan, 2001;Hall and Hord, 2001). This can also lead to 'false clarity'.

'False clarity' means that the interpretation of the change is oversimplified and there is more to it than is perceived or realized by the implementers.

Complexity is another variable that impacts on implementation. Fullan (2001) described Complexity as, "the difficulty and the extent of change required of individuals responsible for implementation" p.78. When people focus on change, they usually think about what will change and the implications of the change. Hall & Hord, (2001) found that most leaders do not seem to consider that there are ways to characterize innovation, and that they can vary in the amount of time, resources and effort required for the implementation. Fullan, however, expressed the view that while complexity may create problems for implementation, in some instances, it may result in greater change because more is attempted p.78.Quality is directly related to change and takes into account the extent to which resources and instructional materials are designed to

support curriculum implementation and teachers are very often concerned about this aspect of the innovation. Ornstein and Hunkins (2004) stated that "to accept an innovation people need to perceive its quality, worth and practicality" p.318.

While curriculum innovations look good on paper and appear to be workable, when attempts are made to implement it, many difficulties arise especially with regards to its practicality. It is further articulated that, even though any curriculum would have evident quality, developers often miss the mark when it comes to practicality. Large scale reforms such as the SEMP curriculum which includes Technology Education, require greater attention to 'front end quality' meaning attention must be given to developing and continually refining 'proven' innovations (Fullan 2001, p.79).

Fullan noted that to achieve large scale reform the process needs to be propelled with high quality teaching and training materials (print, video, electronic). He went on to say that there will still be the problem of superficial implementation when new materials are in use, and even new practices are evident without deeper understanding required for substantial and sustained implementation. Another key aspect to implementation is communication. Communication transmits facts, ideas, values, feelings and attitudes from one individual or group to another. To assure that the communication network is comprehensive and the message sending avenues are in place, the curriculum specialist must understand both the formal and informal channels of communication within the school. Vertical and horizontal communication is needed, but horizontal or lateral

communication moves easily among persons who consider themselves equal and equally involved in the change. Hall & Hord (2003) noted that communication needs to begin before implementation is expected. He further stated that a one time announcement does not get everyone on board.

Communication channels must be kept open so that the innovation is not a surprise to those involved. There should be frequent discussions among teachers, principal, and curriculum officers and all others involved before and during the implementation process about the impending change.

Researcher Berman and Mc Laughlin cited in Fullan (2001) p.88 found that projects that were not implemented effectively were discontinued. They also found that only a minority of those that were well implemented were continued beyond the period of funding. The reasons for lack of continuation were in the main the lack of interest and staff support – especially by central district office – and the inability to provide money for professional development for both continuing and new teachers.

Miles and Huberman (1994) stressed that continuation or institutionalization of an innovation depends on whether or not the change gets embedded or built into the structure through policy, budget, timetable. Other infrastructural factors such as negative school cultures, uncoordinated state policies, staff or administrative turnover all affect successful implementation and are fateful for sustained reform.

Barriers that impede implementation

Good Watson (1967) as cited in Pratt (1994) suggested that if people appeared to resist change, it must be because the natural human drive for newness and excitement was being counteracted by opposing forces which act both on personality and institutional dimensions.

The major personality factors antagonistic to change are: the tendency of any organism to return to equilibrium after disturbance; to prefer the familiar and habitual; to stick with coping strategies previously found successful; to discount ideas that conflict with established attitudes; to emulate the values and behaviors of past or present authority figures; to distrust one's own power to bring about change; to identify change with seduction and moral decay; and to yearn for the good old days.

Watson continued by saying that resistance in social systems appeared to rest in the conformity of groups to established norms; apprehension of side effects of the change; vested interests; commitment to deep seated beliefs and loyalties and rejection of 'outsiders' who advocated the change.

The specific barriers that occur in educational institutions appear to have certain main sources which are motivation for the change, vulnerability, inadequate resources such as time, material resources necessary funds, and scepticism.

Motivation

Teachers and administrators who have had no input into a new curriculum will have no sense of ownership of the innovation. Change agents should be sensitive to the fact that the existing curriculum, however barren it appears may be meeting important needs. Many people think it is just easier to keep things the way they are (Ornstein and Hunkins, 2009 p.256)

Vulnerability

Teachers are vulnerable in terms of their roles and responsibilities. The more rigidly such roles are defined, the greater the resistance to the proposed changes. The antidote to vulnerability is trust. Change agents must work to develop trusting relationships among all those involved including teachers, administrators, learners and the public.

Inadequate resources

Almost any curriculum change requires additional resources, such as time and material resources, administrative support and expertise, financial support and facilities and equipment. In Technology Education financial support and facilities are essential for implementation.

Administrators of the Technology Education curriculum should be obliged to spend time explaining the current innovation to teachers and parents; organizing professional

development; trouble-shooting at first time problems and working in liaison with curriculum designers.

It is important for curriculum developers to make accurate estimates of the new time commitments required and to clarify where the time is to come from.

A thorough inventory of the material resources required must be made and budgeted for accordingly. The necessary funds, facilities and equipment must be provided, but, in the real world these requirements are often unmet (Pratt, 1994).

Teachers who lack the necessary expertise are ill equipped to implement change. They must have a competent grasp of the subject matter which they receive through specially designed in-service training. Without this teachers are likely to continue doing what they have previously done with at most a few surface changes.

Scepticism

Often a teacher's scepticism is rooted in previous experiences. Educators have often become victims of magic formulas and panaceas where innovations are concerned and so their reluctance to be taken in again is both understandable and justified. Ornstein and Hunkins (2009) posited that if something is implemented this year, it will most likely be abandoned when another innovation appears and therefore make all their efforts useless. They become "innovation shy". They continued to say that other barriers to

change are lack of benefits, increased burdens, loneliness, insecurity, norm incongruence and boredom p.257.

2.6 The Principal as a Facilitator of change and the Teachers' Roles and Perceptions of Change

The principal is pivotal to the success of having innovative programs delivered in schools. It is here at the school level, the meaning of the phrase "the school is the unit or center of change" becomes evident (Fullan, 2001 p. 82).

All major research, on innovation and school effectiveness, show that the principal do not play instructional or change leadership roles as they ought to (Fullan, 2001p.82). Berman and Mc Laughlin (1977) as cited in Fullan (2001) found that "projects having the active support of the principal were the most likely to fare well" p.83.

Principals' actions serve to legitimize whether a change is to be taken seriously (and not all changes are) and to support teachers both psychologically and with resources. It is also noted that one of the best indicators of active involvement is whether the principal attends workshop training sessions. Hall & Hord (2003) posited that all too frequently, the principal is bypassed and only the teachers are trained. The principals should know what the teachers are asked to do as he assumes the role of change facilitator; he makes a big difference in how successful teachers will be with implementation. Ornstein & Hunkins (2009) stated that the principal plays a major role in program improvement.

They can determine organizational climate and they can support those persons involved in the change effort. If the principal creates an atmosphere in which good working relationships exist among teachers, those teachers will then be willing to take the necessary risks to create and deliver new programs. It is more likely that program changes will be implemented pp. 267-268.

The principal acts as an initiator of the innovation and therefore must have a clear vision about the school and what resources the change process requires. He must have high expectations, be willing to push for change and take responsibility for decisions and be able to delegate responsibility. As a school manager, the principal must provide the resources to effect the change and have a personal interest in getting things done. As a responder, he must also listen to the concerns of teachers, students and parents relating to the implementation of the change.

The principal therefore is the primary catalyst and facilitator of any change. He is the "gate-keeper of change" (Fullan,2001).

Teachers' Roles and Perceptions about Curriculum Implementation and Change.

Teachers play a critical role in determining whether the change is successful or not (Hall &Hord, 2001, p.12). Teachers' attitudes and perceptions impact or affect how successful the plan will be. Some teachers, depending on their personalities and influenced by their past experiences and stage of concern, are more self-actualized and have a greater

sense of efficacy, which leads them to take action and persist in the effort required to bring about successful implementation (Fullan, 2001 p. 84).According to Mc Neil (2003), experienced teachers see value in new curriculum programs and materials from external authorities. They expect that a new curriculum with its rationale, ideas and suggested activities for students will add to their own knowledge of subject matter and teaching methods, enabling them to find better ways for promoting learning and motivation. A teacher's psychological state can be a permanent or changeable trait, depending on the individual and on the conditions. The culture or climate of the school can shape an individual's psychological state for better or for worse. In the final analysis, it is the actions of the individual that count. Since interaction with others influences what one does, relationships with other teachers is a critical variable (Fullan,2001 p.84). He further clarified this point by noting that change also involves learning to do something new, and interaction is the primary basis for social learning.

New meanings, behaviors, skills and new beliefs depend significantly on whether teachers are working as isolated individuals or are exchanging ideas and positive feelings about their work. The quality of working relationships among teachers is strongly related to implementation. Collegiality, open communication, trust, support and help, learning on the job, getting results and job satisfaction and morale are closely interrelated. Hall & Hord (2001) p.15 summed it up by saying that "change is a team effort."

2.7 The Concerns Based Adoption Model (CBAM) and the Stages of Concern

The Concerns Based Adoption Model (CBAM) was developed to serve change facilitators and to focus attention on the needs of the individual so that change is personalized (Hall & Hord, 2006, p.257).

The CBAM focuses on the adoption (implementation) phase of an innovation, and according to Ornstein & Hunkins (2009) p.261, it involves enabling teachers to adopt a new curriculum and view it as their own. It is important to pay attention to teachers' concerns when they begin use of the new curriculum as this ensures greater success. Upon commencement of an innovation most individuals are sceptical and often adopt a "wait and see" attitude.

CBAM adopts a humane approach to curriculum change because of its prescription and diagnostic dimensions (Hall & Hord, 2006 p. 257).

The framework of the CBAM has several specific aspects that guide implementation. Firstly, it assumes that change is a process not an event (Fullan, 2001, Ornstein & Hunkins 2004).

The second aspect is from the individual's perspectives and not the institution's. Fullan (2006, p.7), suggested that successful change starts and ends at the individual level. Sowell (2000) added that "individuals change before organizations change." Change actions must focus on people because their reactions and adjustments are essential. An

institution or curriculum is changed only when a sizeable number of people associated with it, change" (p. 241).

The third assumption or aspect of the CBAM is that change is a personal experience. Change agents often ignore the perceptions and feelings of the people. Change is brought about by the individuals, so their satisfactions, anxiety, frustrations, concerns, motivations and perceptions all contribute to the success or failure of the change initiative.

The final assumption of the CBAM is that change involves developmental growth in both feelings about and skills in using new programs (Hall & Hord, 2001). Lunnenburg and Ornstein (2004) found that teachers view curriculum programs as requiring them to learn new teaching skills, developing new competencies in curriculum development and the management of learning resources, or acquire new skills in inter-personal relations.

Individuals therefore, go through developmental processes which include their feelings and skills as they work with curriculum innovations.

The Stages of Concern

Stages of concern show us a way of thinking about peoples' feelings and perceptions about change. A comprehensive definition of the term concern developed by Hall & Hord (2006) is:

"The composite representation of the feelings, pre-occupations, thought and

consideration given to particular issue or task is called *concern.* Depending on our personal make-up, knowledge, and experiences, each person perceives and mentally contends with a given issue differently; thus there are different kinds of concerns" p.138.

Sowell 2000, Hall & Hord, 2006 contended that teachers go through different stages of concern ranging from self, to task and sometimes impact. Hall & Hord (2006) cited (Hall, George, & Rutherford, 1979 p.5) who found that close personal involvement is likely to mean more intense concern which will be reflected in greatly increased mental activity, thought, worry, analysis and anticipation. Through all of this, it is the perceptions that stimulate concerns not necessarily the reality of the situation p.139.

Hall & Hord (2006) has enumerated seven stages of teachers' concerns involving their perceptions, challenges, feelings, motivations, frustrations and satisfactions as they go through the implementation process. These seven stages include the awareness stage, where the teacher shows little concern about the innovation. This is followed by the informational stage when the teachers' selfless interest deepens and is concerned about the general characteristics, effects and requirements for using the innovation. The teacher then personalizes his/her concerns about personal adequacy, rewards, status, decision making, potential conflicts with existing organizational structures before making a personal commitment to the innovation. In the management stage, attention

is focused on the processes and tasks, best practices, information and resources to effectively manage the change process.

The fifth stage or the consequence stage is when the teacher focuses on the relevance of the innovation for students, evaluation of student outcomes, including performances and competencies, and changes needed to increase student outcomes.

In the sixth or collaboration stage of concern, the focus is on collaboration and coordination with others regarding the use of the innovation. The final or refocusing stage of concern, the teachers perceive more universal benefits to the innovation and has definite ideas about alternatives to the existing form of the innovation.

2.8 Evaluation of Curriculum Innovations

Evaluation of curriculum innovations plays a significant role in the implementation process. It allows for the authorities to see if the innovations are working or if it is achieving the intended goals and objectives. Ornstein & Hunkins (2004) p.330 stated "evaluation focuses on discovering whether the curriculum as designed, developed, and implemented is producing or can produce the desired results." They further noted that evaluation serves to identify the strengths and weaknesses of the curriculum before implementation and the effectiveness of its delivery after implementation. This means that evaluation must be an on-going process.

One prominent curriculum evaluation model as espoused by Daniel Stufflebeam is the Context, Input, Process, Product (CIPP) model.

Ornstein and Hunkins (2004), defined the four stages of the CIPP model:

Context evaluation involves studying the environment to determine the conditions, focusing on the unmet needs and diagnosing the reasons for unmet needs. Input evaluation is designed to provide information about the use of resources. It focuses on feasibility and alternative designs may be considered that will lead to curriculum goals that require fewer resources, less time and less money. The third stage is the process evaluation which addresses curriculum implementation decisions that control and manage the program. It is used to determine the congruency between the planned and actual activities. In any implementation study, the process stage of the CIPP model is important as it 'debugs' the program of any unforeseen barriers that may affect effective implementation. The final stage is product evaluation which determines whether the final curriculum product now in use is accomplishing what they had hoped p. 288.

2.9 Summary of the Literature Reviewed

The focus of the review was on issues related to the Technology Education curriculum in general according to the ITEA 2000 standards and specifically to Trinidad and Tobago. It discussed the philosophy that influenced the curriculum document and gave an overview of its vision, rationale, goals and objectives of the curriculum in the context of

overview of its vision, rationale, goals and objectives of the curriculum in the context of this country.

The review gave direction on how the Technology Education curriculum is to be delivered; its teaching, learning and assessment strategies and also to whom – the students of forms one to three at all secondary schools in Trinidad and Tobago.

The literature also highlighted the implementation process of a curriculum and warned of the pitfalls or barriers that may hinder or impede successful implementation. The literature commented on the roles and responsibilities of the principals and teachers as they facilitate and implement change. The review suggested ways to effect implementation by avoiding such variables as 'false clarity', complexity and lack of understanding of the change. It also suggested that quality and communication plays a vital role in promoting effective implementation.

The review also pointed to specific barriers that hinder or impede implementation such as inadequate or lack of resources for example time, money, materials, facilities and equipment, vulnerability and Scepticism.

It proposed two models for evaluation of the implementation phase of a curriculum – the CBAM and the CIPP. The Literature Review gave a survey of the implementation process of a curriculum and specifically the Technology Education curriculum of Trinidad and Tobago.

Chapter Three

Methodology

3.1 Rationale for a Qualitative Approach

A qualitative research design in the form of a case study was adopted for this research as it sought to explore the implementation phase of the Technology Education curriculum. Qualitative research allows for this in depth, small scale study to be investigated in its natural setting within the boundaries of the Technology Education classroom.

In this case study the researcher acquired the knowledge and facts, related to the investigation and played a significant role in the study as well. This researcher tried to understand what the participants were thinking and why they thought the way they did. Fraenkel & Wallen, (2003) posited that all the assumptions, motives, reasons, goals and values are of interest to the Qualitative researcher p. 432.

In qualitative research, the researcher also sees the hermeneutic circle of inquiry, as well as certain philosophical and theoretical principles as guidelines for the research.

3.2 Rationale for the Case Study

The researcher sought to discover the extent to which the Technology Education curriculum had been implemented and to gain insights into how things got to be the way they were (Merriam, 1998). The researcher wanted to understand the contributory factors that influenced the change whether it was time, funding, lack of interest or personality. This design was chosen because the researcher was interested in gaining an insight, explanation and interpretation of what was happening, or what had happened, to a particular curriculum – in this case the implementation phase of Technology Education.

The case study design also allowed the researcher to use multiple sources of information such as observations, interviews and the examination of documents. Through the use of these forms of data, the enquirer acquired a rich, detailed description to support the case.

3.3 School Setting

School #1 was opened in 1972 as a Junior Secondary School with forms one to three. It was converted to a five year school in September 2007. It is a co-educational school with a student population of nine hundred and seventy three. The staff is comprised of seventy eight teachers with four appointed Heads of Department, one appointed Vice Principal and one appointed Principal.

The subjects offered at the school at the forms one to three level are Language Arts, Mathematics, Spanish, Social Studies, Physical Education, Integrated Science, Music and the Technical/ Vocational subjects Home Economics, Industrial Arts and Agricultural Science. These subjects are examined at the National Certificate of Secondary Education (NCSE) level, at the end of form three. The students who would have otherwise gone on to the Senior Comprehensive School will now continue their education through forms four and five. They will then be examined at the Caribbean Secondary Education Certificate (CSEC) otherwise called the Caribbean Examinations Council (CXC) level. (Appendix B).

School #2 was opened in 1963 as a Secondary School with forms one to five but later went on to the form six level. It is considered to be an 'academic' school. It is a co-educational institute with a student population of nine hundred and seventy. The staff is comprised of fifty six teachers with three appointed Heads of Department, one appointed Vice Principal and one appointed Principal.

The subjects offered at the NCSE level are the same as school #1 but the CSEC or CXC subjects are more varied. This school also offers the Caribbean Advanced Proficiency Examinations (CAPE) (Appendix C).

3.4 The Sample and the Rationale for the Sample

The sample for this study came from two schools #1 and #2. It comprised of six participants who were: two principals and four Technology Education teachers.

Purposeful sampling allowed choosing the subjects who had adequate knowledge and experiences with the case investigated.

Fraenkel & Wallen (2003 p. 104) informed us that "researchers use their judgment to select a sample that they believe, based on prior information, will provide data they need." According to Patton in Gall, Gall and Borg (2003), purposeful sampling refers to the practice of selecting cases that are likely to be information rich with respect to the purposes of the study. Creswell (2003) stated that this kind of sampling is best suited as the researcher selects participants, sites, documents or visual material that will best help the researcher understand the problem.

As a consequence, the sample was chosen from those persons who have been directly involved with the implementation of the Technology Education curriculum and who have adequate knowledge and experiences with this program. These participants,

together with other forms of data, therefore provided the rich data required to conduct this research.

The teachers chosen were those who teach the forms one to three at the secondary schools where this curriculum was supposed to have been implemented. The principals are the ones who have to make administrative decisions and give consent to the amount of time allotted on the school's timetable.

3.5 Data Collection Strategies Employed

Interview was the main method of data collection for this study. The researcher conducted face-to-face interviews with the participants using unstructured and generally open-ended questions (Appendix D). The intention was to illicit views and facts from people who have the knowledge and experiences. Audio-tapes were used to record the information. One participant did not wish to be audio-taped therefore hand written notes were taken.

Interview is a very effective way of data collection and is a most appropriate method for this type of research as it allows for direct contact with the subjects. Fraenkel & Wallen (2003 p.458) described interviewing as the most important data collection technique that a qualitative researcher can use.

Other sources of data were documents such as newspaper articles, curriculum documents, school records and internet websites such as government's websites.

Prior to interview appointments permission was sought from all those involved.

3.6 Ethical Considerations

I sought the permission, from the participants, to record their responses on a voice recorder. I also informed them - by verbal and written communication (Appendix E) that confidentiality and anonymity will be strictly adhered to and they reserve the right to withdraw from the interview and from participating in the study if and when they wished to do so.

3.7 Methods of Data Analysis

Data analysis involved the analysis and synthesis of the information collected from the various resources into a coherent description of what was discovered (Fraenkel & Wallen, 2003).

The information collected was transcribed and read five times to get a general sense of the issue. Data were reduced by using three colour codes relating to the three research questions (Appendix F). From the three colour codes, fifteen categories were identified. These categories were further reduced to six themes which were placed in tabular format. An in depth analysis then formed the narrative for the study.

3.8 Limitations

- The time available for the conduct of the study limited the depth and scope of the study.
- The sample size was small and the conclusions may not reflect what is happening in other schools in the country.
- There was a limitation on the data as preliminary enquiries reveal that an evaluation of this curriculum was never done.
- Stakeholders' willingness to give relevant and pertinent information impacted on the study.

3.9 Delimitations

- This study was restricted to the concerns of teachers in two schools. This restriction was essential because of the time constraints.
- The findings may not be applied to other schools in Trinidad and Tobago because of the differences in the context of the various schools.

Chapter Four

Data Analysis and Presentation of Results

This study evaluated the implementation of the Technology Education curriculum at two secondary schools in Trinidad. This chapter presents results of the qualitative data collected, analyzed and used for answering the three research questions. For confidentiality, the actual names of the schools studied and those of the participants have been coded as shown. Should any need for further identification arises, the researcher through the School of Education, University of the West Indies can attend to it.

The participants of the two schools were noted as follows:

School #1: Interview #1:- Principal #1, Teacher #1M, Teacher #1A

School #2: Interview #2:- Principal #2, Teacher #2D, Teacher#2K

4.1 Analysis of Research Questions

Research Question One

How has the Technology Education curriculum been implemented in this school?

In response to this question:

Principal #1 said that it was done for almost a year by the Information Technology teacher because he was interested in it.

Principal #2 said that it was done "in a sort of a way" and for "a short time."

This principal (#2) added that Technology Education will be implemented in a "dual way" that is Technology Education and Technical/Vocational being taught side by side.

Teacher #2D (Diploma in Technology Education and Head of Department) responded by saying that implementation will begin in September 2009 at the forms 1&2 levels but, he felt that they (Ministry of Education -MOE) are "coming down on us" in that the MOE is now asking for Technology Education marks instead of Home Economics/Industrial Arts/Agricultural Science marks for the NCSE.

Principal #1 stated that Technical/Vocational subjects will not be phased out but the focus will be on teachers using the "Tech Ed. approach" in their individual subject areas.

One gets the feeling that these teachers and principals think that their backs are against the wall by this mandate and since school #2 especially is highly exam and results

oriented they feel the imperative to start. They felt "we have to do something." The expectations however, is that implementation will fail again.

Teacher #2D commented "we will end up in the same place.....but, if they want us to do it, we'll do it!"

It is to be noted that the policy by MOE is not a "duality" or using the process in the Technical/Vocational areas but to phase it out completely and implement Technology Education.

Research Question Two

Are the measures put in place by the MOE adequate for implementation

of the Technology Education curriculum?

Principal #1 responded that he was never invited to any workshops or seminars concerning this subject. He opined that this situation was outrageous!

Principal #2 had similar sentiments but commented further that measures were not only inadequate but that he got nothing at all. He also was not apprised for the change through any seminar or workshop.

The four teachers said that the training, being the only measure – was inadequate. Only three teachers were trained at the Diploma level in school #1 and one teacher #1A in that school thought that the one month training at the August Institute 2000 was

"highly inadequate" and "not enough to make her a teacher of Technology Education." She added that the training she received was really an introduction of what they were really trying to implement.

The other teacher #1M described the training as "miniscule." He stated sarcastically that "they (MOE) want us to spin gold from straw."

Teacher #2K commented that the recent one day seminar was really about how to mark portfolios and not training to be a Technology Education teacher.

Teacher #2D almost shouted "…….but we received nothing at all, nothing!"

The consensus of all four teachers and the two principals is that there were no measures put in place to implement this new innovation. They got no financial resources

(teacher #1A said she had to use her own money to purchase materials), no facilities or equipment, no materials, not even the syllabus. They all said that they heard that there is a new draft syllabus out in 2008 but had not received anything.

Research Question Three

What are/were the inhibitors, (if any) of this curriculum change?

Principal #2K said that "the first time after 3-4 years, a lady came and told him that she was the examiner for the subject. That is not good!"

Teacher #2D had a very terse answer to this question. His response was "Who is the Curriculum Officer? I do not know if there is one at all! I don't know anybody. I don't know if it is a "he or a she."

Teacher #2K said that she had not seen the Curriculum Officer for Technology Education but the Agricultural Curriculum Officer had visited several times.

Principal#1 stated that he had never seen any.

Teacher #1A answered that she had not seen the Curriculum Officer since 2000. "For the last nine years I have not seen a Curriculum Officer for this subject! I do not know who to call when I have a problem."

Teacher#1M responded, "No, never seen him or her!"All four teachers said that they received full support from their principals in all their decisions concerning Technology Education – whether to implement or to stop implementing.

Concerns for other stakeholders caused the principals and teachers to have a re-think on the continuation of the curriculum.

Principal #2 said that the business community must be brought on board because they are the future employers and when they see Technology Education on the students' resume they will ask for an explanation of the meaning of this new "thing." He continued by saying that the parents will frown at the "old subjects (Technical/Vocational) being phased out" because these are the subjects that were

usually chosen for the CXC. He said that these subjects, Food and Nutrition, Agricultural Science are usually "over subscribed."

Principal #1 asked rhetorically "What recognition does Technology Education have on the National/International community or the business community? They need to know more about Technology Education." He continued "What does Technology Education certify a student to do? Food and Nutrition says for example that a student is skilled in baking."

Another concern that has acted as an inhibitor was the concern for the student at the CXC level. The concern is that the teachers will have an uphill task in terms of time spent on teaching Technology Education at the forms one to three level rather than teaching the basics or foundation of Home Economics and Agricultural Science. The teachers also felt that there was no continuity from Technology Education at forms one to three and examined at the NCSE level and then starting Home Economics/Agricultural Science at the CXC level.

Teacher #2D said that "Tech. Ed. dead there" that is no continuity after form three. Another issue raised by this teacher was there will be no marks or grades to guide selection for Food and Nutrition/Home Management/Clothing and Textiles/Agricultural Science when they are choosing these subjects to continue on to forms four and five.

This teacher also saw that teaching Technology Education at that school will not be a positive step in that the school was "an academic school and the students were used to

academic type subjects and the teaching, learning and assessment strategies that go with it."

Teacher #1M opined that the students will face "very, very big limitations" and that at the end of form three the students will be left "hanging in the air."

All participants expressed concern about the future performance at the CXC level.

Both principals felt that the CXC was more important in the life and future of the student and had greater impact in terms of employment and moving on to CAPE – the Advanced Level examinations – and then to University.

They felt that the CXC results are more important than the results of the NCSE examinations.

Principal #1 stated that there was not enough time to study for the CXC just one year and one term. He said that these students were the ones who scored less than 30% at the SEA (Secondary Entrance Assessment) and so they needed all the time "they can get" so that they can be better prepared for the CXC in two years time.

Teacher #2 also brought up this issue. He said that this subject does not provide a base for the CXC in the later forms four and five. Technology Education offers one approach and ends abruptly and CXC starts with another approach and ends with a totally different type of examination.

Another inhibitor to implementation of Technology Education was the lack of resources. There were no equipment and facilities, no space for additional classrooms as teacher #2D put it "forty students cannot fit in a Tech. Ed. class," no computers, no software, no syllabus, no funding and inadequate training.

One teacher said in a sad tone that the excitement he once felt for teaching Technology Education had gone because of the challenges faced and another teacher summed it up by saying "we got nothing, absolutely nothing!"

These two schools never received any kind of resources to begin implementation. This lack of resources resulted in strong negative feelings by all participants towards the implementation of this subject.

Prinicipal #1 stated that "Tech/Voc is in a total mess because of Tech. Ed." He felt that there was a "tremendous loss" to the Technical/Vocational area. He expressed the view that there was a lot of uncertainty in Technology Education "Nobody knows what they are doing. I have no confidence in Tech. Ed."

Teacher #1A held the view that one project was too time-consuming and students especially at the lower end – less than 30% at the SEA – will get bored with the one or two projects per term. This teacher too had strong feelings saying that "I have no inclination towards Tech. Ed. .....I'm disillusioned by it.....it is a waste of money!"

A belief that Technical/Vocational subjects are more beneficial to the students than Technology Education acted as a barrier to implementation.

Teacher #1A strongly believed that "Tech/Voc wasn't inefficient and that the students did well. It gave students a career and played a critical role in supplying the labour force with technicians, farmers, mechanics and even teachers." She reminisced about her own pleasant and positive experiences of Agricultural Science.

Another inhibitor that emerged from the interview was scepticism.

Principal #1 expressed his concern for the mobile carts that the MOE promised. He said "I do not know how it will improve the present Tech. Ed. curriculum." He continued "We were promised some labs, but nothing came."

Teacher #1M stated that he was sure the mobile labs will fall short in terms of what it contains as it cannot accommodate all the activities of a fully furnished laboratory. He added that because of the economic downturn the MOE will not be able to provide the type of equipment and materials, continuous funding and training required for implementation in September 2009. He said "I cannot see it happening."

Teacher #2D said the mobile labs are "……just expectations."

When the participants were asked what they thought about the future of Technology Education. Their responses were:

Principal #1 said "Never. It cannot produce the personnel that industry requires."

Principal #2 replied that he foresaw the subject as part of a package that will become tomorrow's education. The 'tomorrow' however was "the next decade."

Teacher #1M responded by saying that Technology Education should be taught across the board –in all areas of the curriculum – and not as a separate subject.

Teacher #1A expressed similar views that the critical thinking and problem solving approach to teaching was good but it should be incorporated throughout all curricula and not as a separate subject.

Teacher #2D opined that "Tech. Ed. has no future in this school."

Teacher #2K said that she was willing to try new things provided that the resources are in place."

Research Question One	Themes
How has the Technology Education curriculum been implemented in this school?	Reluctance to implement then and now.
Research Question Two	
Have the measures that were put in place by the Ministry of Education adequate for implementation of the Technology Education curriculum?	School Preparedness -Training -Resources -Facility and equipment -Funding
Research Question Three	
What are/were the inhibitors, if any, of this curriculum change?	Support by the Ministry (Curriculum Officers) Concerns -Business community and Parents -Performance at CXC -Certification and Recognition Scepticism Hope for the Future of Technology Education

Chapter Five

Presentation of findings, discussion and conclusion

This chapter presents major findings of the study based on the analyses of the data collected.

The Level of implementation of the Technology Education Curriculum in the two schools.

On this theme, it was discovered that, the process of the implementation of the Technology Education curriculum began in both schools but was done in a haphazard way. It was not implemented as it should have been for various reasons and therefore interest waned.

Both principals stopped the program at their respective schools, after five years in one school and "approximately" one year in the other.

There was apparent reluctance to start Technology Education years ago and there still is a reluctance to re-start despite a mandate to begin implementation of the program by September 2009.

There is a general feeling of mental anguish or dread being experienced by both teachers and principals as they think, worry and anticipate what the future holds in terms of the impending mandate.

The principals and teachers however, are willing to comply with the mandate, if given, to re-start the process, but on their terms.

On the adequacy of the measures that were put in place by the MOE for implementation of the Technology Education curriculum in the two schools.

The study found out that, the principals of both schools were not prepared for the change. There were no measures put in place to ensure the implementation process took place. The basic reason was that they received no resources and the teachers became increasingly unable to make sense of the change. The support from the Ministry needed for the change process, over the years, had not been forthcoming.

All six participants agreed that there is a need for training and re-training of teachers before implementation is to begin in September 2009.

Some of the inhibitors of this curriculum change identified.

The study identified some of the inhibitors for the effective implementation of the Technology Education curriculum in the two schools among others as follows; the lack of support from the Ministry of Education through Curriculum Officers. Nobody seemed to know who the person is or where that person can be found.

That person surely never visited any of the two schools. The teachers however received full support from their principal in all their decisions concerning Technology Education – whether to implement or to stop implementing.

Concerns for other stakeholders caused the principals and the teachers to have a re-think on the continuation of the program. The business community and the parents were not sufficiently informed, if at all, about this innovation. As a result the business community started asking questions about this new "subject" and the parents frowned at the removal of the Technical/Vocational subjects.

The students of one school stayed away or "broke" the Technology Education classes and the teachers were disgruntled. When this school stopped the program and reverted to the Technical/Vocational areas, both teachers and students were motivated and the students returned to their scheduled classes.

Another issue was that the teachers of the schools who received these students after the NCSE exams – the Senior Comprehensive schools - complained that the students' grades fell from 80% to 20% when Technical/Vocational subject areas were removed.

Another inhibitor was the concern of the students' performance at the CXC level. There was the feeling that the teachers would have an uphill task in terms of time spent on teaching for the CXC because Technology Education had taken that time slot at the forms one to three levels rather than teaching the basics or foundation of Home Economics and Agricultural Science. The teachers also felt that there was no continuity from Technology Education at forms one to three - examined at the NCSE level - and then starting Home Economics/Agricultural Science at form four to be examined at the CXC level.

The general consensus was that CXC was more important and had greater impact on the future of the student and their eventual career than Technology Education.

Another issue raised was the mark or grade used to guide selection for the CXC Food and Nutrition, Home Management, Clothing and Textiles or Agricultural Science would be non existent if Technology Education was taught at the form three levels. It was explained that the marks gained at the form three levels were used as a guide to select students for these oversubscribed areas.

It was noted that one school (#2) was an "academic type" school where the students opted to study medicine, law or engineering and that Technology Education would waste these students' time.

The lack of resources caused the program in both schools to eventually halt. This lack also led the teachers to have strong negative feelings towards implementing this curriculum.

The successes experienced by both students and teachers in the Technical/Vocational areas led to the belief that this area was and is more beneficial to the students and so this feeling still acts as a barrier to implementation.

DISCUSSION AND CONCLUSION

For the fact that only two out of over one hundred schools that are supposed to be running Technology Education in the country were studied, does not warrant generalizations or recommendations for the entire country. However, based on the findings of the study as it affects two schools, it was concluded that change, in the form of the introduction of a new curriculum to a school must be accompanied by effective support of various kinds so that principals are better informed and can gain a greater understanding of the change so that they can lead the change.

Through continuous support teachers acquire the capabilities and confidence to fully accept the challenges embodied in the implementation process.

In this study, both the principal and teachers received no kind of support from the Ministry of Education through the Curriculum Officer and that need had a tremendous impact on the non-implementation process at these two schools.

It caused distrust and loss of confidence in the subject being beneficial to the students.

According to one principal, "Technical/Vocational subjects are in a mess because of Technology Education." Strong beliefs that Technical/Vocational subjects are more beneficial to the students caused an eventual collapse of teaching Technology Education and reverting to the former subject areas at these two schools.

No support also meant that there was no communication between the Ministry and these two schools. This gave rise to feelings of self-doubt, insecurity, confusion and frustration by all six participants. It also caused a lot of concerns for the future of their students.

Economic, cultural, social, political and educational threats are important factors to note when implementing new changes in a school.

Specific barriers encountered by these participants such as lack of motivation, inadequate resources, necessary funds not forthcoming and scepticism must be removed before implementation is to begin in September 2009.

If these barriers are not removed then effective implementation will not happen soon, may be in the next decade or as one principal put it "never."

The study therefore can be considered to have served as a springboard from which other action can be taken towards getting the root cause of the problem of lack of implementation or at least knowing the level of implementation of Technology Education in Trinidad and Tobago. However, a more in depth study is required on a wider scope to be able to ascertain the real status of the implementation of this kind of education in the country.

References

Cresswell, J. W. (2003). *Research Design Qualitative, Quantitative and Mixed Methods Approaches.* (2nd ed). Thousand Oaks. SAGE Publications.

Doll, R. C. (1996). *Curriculum Improvement: Decision Making and Process.* (8th ed). Boston: Allyn and Bacon.

Executive Summary. Advancing Excellence in Technological Literacy: Student Assessment, Professional Development and Program Standards. Retrieved March 15 from http://www.iteaconnect.org/TAA/PDFs/AETLExecutivesummary.

Fraenkel, J.R. & Wallen, N.E. (2003). *How to Design and Evaluate Research in Education.* (5th ed). San Francisco. Mc Graw-Hill.

Fullan, M. (2001). *The New Meaning of Educational Change.* (3rd ed). New York: Teachers' College Press.

Gall, M. D., Gall, J. P. & Borg, W. R. (2003). *Educational Research. An Introduction.* (7th ed). Boston: Allyn and Bacon.

Government of the Republic of Trinidad and Tobago, MOE. (2002-2006). *Strategic Plan.*

Port of Spain: Government Printery.

Hall, G. E. & Hord, S. M. (2001). *Implementing Change: Patterns, Principles and Potholes.* Boston. MA: Allyn & Bacon.

Hall, G. E. & Hord, S. M. (2003). *Implementing Change: Patterns, Principles and Potholes.* Boston. MA: Allyn & Bacon.

Hall, G. E. & Hord, S. M. (2006). *Implementing Change: Patterns, Principles and Potholes.* Boston. MA: Pearson.

International Technology Education Association. (2000). Retrieved March 15, from http://www.iteaconnect.org.

Lunnenburg, F.C. & Ornstein, A. C. (2004). Educational Administration: Concepts and *Practices.* (4th ed). Australia: Thomson/Wadsworth.

Mc Neil, J.D. (2003). *Curriculum: The Teachers Initiative.* (3rd ed). Columbus Ohio. Merrill/Prentice Hall.

Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education.* San Francisco: Jossey-Bass Publications.

Miles, M. B. & Huberman, M.A. (1994). *Qualitative Data Analysis.* (2nd ed). London: Sage Publications.

Ornstein, A. C. & Hunkins, F. P. (1998). *Curriculum: Foundations, Principles and Issues.* (4th ed). Boston, MA: Pearson.

Ornstein, A. C. & Hunkins, F. P. (2004). *Curriculum: Foundations, Principles and Issues.* (5th ed). Boston, MA: Pearson.

Ornstein, A. C. & Hunkins, F. P. (2009). Curriculum: *Foundations, Principles and Issues.* (8th ed). Boston, MA: Pearson.

Pratt, D. (1994). *Curriculum Planning: A Handbook for Professionals.* Harcourt Brace College Publishers.

Republic of Trinidad and Tobago, MOE. (2001). *Secondary School Curriculum. Technology Education.* Rudrunath Capildeo Learning Resource Center: Curriculum Development Division.

Republic of Trinidad and Tobago. (2006). *Vision 2020. Operational Plan 2007-2010.* Post of Spain: Government Printery.

Rogers, E. M. (2003). *Diffusions of Innovations.* (5th ed). New York: The Free Press.

Secondary Education Modernization Programme. (2002). *Providing Quality Education For All.* MTS Plaza. Aranguez. Trinidad and Tobago.

Subran, D. (1994). *Planning a Curriculum in Technology Education for Secondary Schools in Trinidad and Tobago.* St. Augustine: School of Education, The University of the West Indies.

Sowell, E. J. (2000). *Curriculum: An Integrative Approach.* (2nd ed). New York. Prentice Hall.

Technology Education. Retrieved March 15 from http:// en.wikipedia.org/wiki/Technology_education.

Trinidad and Tobago National Task Force on Education (1994). *Education Policy Paper* (1993-2003). Port of Spain. Government Printery.

What is Technology Education. Retrieved March 16 from http://www.technologyeducation.org/topicoftheday/whatistechnologyeducation.html

LIST OF APPENDICES

Appendix A

RESOURCES
COMMUNICATION TECHNOLOGY

YEAR II

TOOLS AND EQUIPMENT	CONSUMABLES
Hardware Technical Specification The module shall include a digital video camera with editing software, digital still camera, VHS tape deck with S-VHS port and cable (controllable), scanner, tripod, monitor. Computer Requirements (12 computers required for this module). Desktop model, 866MHz Pentium (or compatible) processor, 128MB SDRAM, 8.0GB EIDE HD. Creative Labs Riva TNT 32 Mb 2D/3D PCI or AGP video card, ati all in wonder radeon video graphics processor 32mb version 1.44MB, 3-1/2" floppy, 104 Keyboard, 17" 1280 x 1024 monitor, 12x DVD drive, SoundBlaster AWE64 sound card or compatible with midi port, PS/2 mouse, Serial and parallel port, 2 USB ports, Windows 98, Altec Lansing sub-woofer speaker system. 10/100 3 com Ethernet PCI card, 17" 1280 x 1024, color monitor, 8x/4x/32x CD-RW DRIVE CD-ROM Read/Write drive (must be rewritable CD-R), DVD drive, EXTERNAL Iomega 250Mb ZIP drive, Hauppauge 400 Win/TV PCI TV tuner card. CPU's must have a minimum of 4 PCI slots for installing cards listed above. Digital still camera 1688x1248 pixels with cable for down load of images to CPU.	250 mb zip disks, Rewritable CD-ROMS 1.44mb floppy disks, Printing paper 8 ½ x 11 and 8 ½ x 14, Ink Jet printer ink, Construction paper Pencil (HB), Glossy print paper (8 ½ x 11) Plotter tape, 8mm S-VHS tapes, Cassette tapes spare bulbs for multimedia projector, White board markers (3 colours).

SOFTWARE AND INSTRUCTIONAL MATERIALS a)2 sets Multimedia Production CD-ROM software, 2 Module Guidebooks, Microsoft Office XP (s) sets, Multimedia authoring software, video editing software, scanning software, photo enhancement, AM/FM receiver, radio transmitter, bar code reader and software, weather satellite down link including 1 meter dish and modulator, 2 sets video conferencing equipment, 2 video cameras with S-VHS port and cable, video signal transmission set, microphones Nero CD burning software, full version. Electronic classroom management software. Roland 8 pen color plotter, 2-position data switch and cabling. Building grids, architectural modeling and prototyping tools, and supply kit for 32 students. Dot matrix printer (one), ink jet printer (one), scanner (8.5 x 14) 2 sets Architectural Design CD-ROM software, 2 Module Guidebooks, AutoCAD LT or AutoCAD LT 2000 software, plotter software, 3-D design software, instructional videotapes and design templates, videotapes, and design templates, videotapes. MULTIMEDIA PROJECTOR (portable) 1024x768 resolution, 400:1 contrast ratio, manual zoom lens. 3 watt communications Laser kit and accessories, optical laser receiver, fiber optics set, fiber optics splicing and polishing set Corel custom photo, video and audio cassettes, video tapes, texts, software	

RESOURCES
PRODUCTION TECHNOLOGY
YEAR II

TOOLS & EQUIPMENT	CONSUMABLES
2 – lbs. Bread-maker machine, electric kettle, metric scale, cutting board, solid measuring cup, liquid measuring cup, measuring spoons, bread knife, paring knife, chefs knife, sifter, wooden spoon, palette knife, rubber spatula, 3 – stainless-steel bowls, bread basket, trivet, plates, kitchen towels, bread cloth, 12-speed blender, juice extractor, electric juicer, 2-litre glass jug, Plastic laboratory equipment consisting of vacuum former, injection moulder and strip heater with molds and supplies, Refrigerator, Bridge-building simulator, Bridge-tester with continuous pressure and deflection apparatus, handy cutters, Pulleys, gears, plastic tubing, Dual temperature glue gun kits, Stanley utility knives, Tubular hack saw (10") Measuring tools, Bridge-building video Cantilever bridges video, Suspension bridge.	Flour, milk, wheat germ, bran, chopped nuts, orange juice, raisins, baking powder, yeast, cream of tartar, 250 ml. Bottles local fruits, sugar, labels, Polystyrene, beads, Bridge materials class packs (280363), modeling glue, jacking glue nails, leatherette, string, tape, bobbin (geared motor), Wood (4" x 1"), aluminum steel rods (3/8) hose 25', metal housing, piston, control valve 1" x 1" RHS'wood (4" x 1") 2" x 1" RHS ½" plywood sheets 8" x 4" hexagon head 3/8" x 16" x 2" screw bolts arc-welding electrodes, assorted rivets fish gun rubber, galvanize (non tubing, ½" diameter), paints varnish

RESOURCES
ENERGY, POWER AND TRANSPORTATION
YEAR II

TOOLS & EQUIPMENT	CONSUMABLES
Screwdrivers – two each of : 3" regular, 4" regular, 6" regular, #1 Phillips, #2 Phillips, yellow, green, red – Robertson, Screw holding screwdrivers 6" Metric/English steel meter sticks, Long nose pliers 6", Slip joint pliers 6", Electrical pliers 6" multi-purpose, 6" diagonal cutting pliers, 9" Vice-grip long nose pliers, Low temp electric glue guns Jewellers' screwdrivers, set of 6, Claw hammers 7 oz, Plastic mallets – 8, Mr. Circuit II Digital Lab Kit, Mr. Circuit II Digital Lab Software SETMC 1 Audio level meter kits, Robot Arm II with joysticks, software and IBM interface, Robotics Fundamentals Robotics texts, Advances in Robotics Video Navius Robot, Robot Power Supply, 2 Briggs & Stratton engines 3.5HP, Small engines tool kit , Multi media small gas engines, Basic Operation Video , Assembling your small gas engine video, Assembly workbooks, Small gas engines texts Briggs and Stratton repair manual, Gasket sets, Storage bins TV/VCR Combo 13" TV with audio and video jacks and earphone jack , Soldering iron stands, Dual temp glue gun kits Stanley utility knives, Styrofoam cutter, Replacement wire Wright Brothers Design Challenge Kits, Wright Brothers Trainer Around the pole Aerospace Activity booklet Laser pointer , 8-cell battery chargers 9V rechargeable batteries, C cells rechargeable	Pulleys, coral, web brackets, Wheels, rope, duct tape, Pencils, coloured markers, Screws, canvas, Lego technology design kit, Bristol board, glue, scotch tape, coloured markers, Audio and video tapes, index cards, bristol board, paper scissors, Tissue paper, cotton thread, glue gun and glue (paper), masking tape, Experimental bread board, 2 mm electronic solder, Motor car oil, Styrofoam blanks chart paper, Various sizes of syringes Vinyl tubing, food colouring, Various pieces of wood, fastenings, strappings, Magazines, glue (paper)

AA cells rechargeable, D cells rechargeable Electronic tool kits, 25' air hoses with quick disconnects, Power bars, Digital/analogue trainer 841143 with DC wall adapters, Mr. Circuit I Electronics Discovery lab kit, Mr. Circuit I Electronics Discovery Software SETMCI Electronic Discovery Video tapes, 0.30 volt DC, 3A power regulated power supply, .049 Engines Maintenance Kits, Glow plugs, Pts fuel, Propellers, Starting spinners, 12-volt starter Glow plug attachment, Battery holder, Power supply 2-Stroke model aircraft engine software 2-Stroke model aircraft engine curriculum Solar energy mini lab. Material for solar energy experiments including: Photovoltaics, passive solar, active solar and high temperature solar thermal. Includes course material. Tomorrow's Energy Today" video, "Photovoltaics" video, solar collector box, thermometers, stopwatch and encapsulated photovoltaic solar cell Wind turbine generator lab. Materials for wind generator experiments including: generator, generator mount, wind turbine hub, fan, wind generation research material, and digital multimeter 20" box fans *Alternative Energy* by M.E. Hazen Motor generator kits including motor, generator, coupling, battery holder, connector, bulb, sockets and base. Estes flight pack, Model Rocketry Video, Altitude finder, Rocket locator, Teacher starter sets, Model glue, Tacky glue, Airfoil and car design wind tunnel 10" diameter clear wind tunnel with variable speed fan, wind speed, lift and drag measuring balances with interchangeable airfoil tube and activity curriculum. Styrofoam cutter, hot wire type with three heat levels and tilting arm, industrial. Wind tunnel fog generator Gallon of liquid fog Nichrome replacement wire for foam cutter 24Ga. 10 ft, Nichrome replacement wire for foam cutter 18Ga. 10 ft, Principles of Flight Video, Hot air balloon video, 38 glasses in Sanitizing cabinet Face shields, First-aid kit , Safety cans, Hearing protection, Hand-powered generator, producing 5 volts AC at 2 amps, "Science fair projects: Energy", ATEC Wind tunnel, Digital wind speed meter, Science of flight pack, Glider CD-ROM, Shoebox R O G rubber-band-powered model airplane kit, Hovercraft Kit consisting of foam tray, two electric motors, two propellers, 9-volt battery strap, slide switch, wire, dowel rods, craft sticks and clips, Kelvin hovercraft video, Flight Simulator program, Pilot Pro Yoke Pedals for Yoke, Principals of flight video, Assembled track , Power supply, Maglev Kits, Maglev Video, Car builder software, Track connector, Alpha III Rocket starter kit, Viking Rocket kits, Particle Masks, Shop Aprons (12), Shop Aprons (12), Fire extinguishers	

RESOURCES
BIOTECHNOLOGY
YEAR II

TOOLS & EQUIPMENT	CONSUMABLES
Test tubes - small, medium Test tube racks Test tube holders Beakers – 50 ml, 100 ml Filter paper – small boxes Funnels – small, plastic Respirators – small Gloves – plastic, small, medium, large Centrifuge Small oven – drying specimens Petri dishes – small, medium Software on nutrient tests, water tests Budding knives Cellophane strips – 7 cm wide and 150 cm long Watering cans – small Rabbit hutches – four to six Feeding utensils Record books Cleaning equipment – brooms, spades, buckets, hoses Grass trimmer with string – small Hydroponics kits Nutrient testing kits Brochure on milk composition of various animals Texts on food – balanced menus, composition of various foods Texts on careers in biotechnology Bio-medical testing kits Peat moss	Soil samples – 1 kg each of clay, sand silt, loam, 10 kg bag of clay, lab reagents for nutrient testing Plant pots Rabbits – 1 buck, 3 does Feed for rabbits Fertilisers for flowering plants, potash – 2 kgs Milk samples from 4 types of animal – 100 ml each Moss – dry, 5 kg. bags Dry grass – 5 kgs Mealy bug larvae, beetle larvae Tomato seedlings 4 – 5 weeks old Limestone – 5 kgs Urea – 5 kgs

Appendix B

SCHOOL #1

SUBJECT CHOICES – SEPTEMBER 2009

STUDENT'S NAME: _____

FORM CLASS: _____

FIRST CHOICE GROUP: _____

SECOND CHOICE GORUP: _____

Group 1	Group 2	Group 3	Group 4	Group 5
English A	English A	English A	English A	English A
Mathematics	Mathematics	Mathematics	Mathematics	Mathematics
Agri. Science	HSB/Agri. Science	Int. Science	Int. Science	Tech. Drawing *
Biology	Lit./T.D./ C. & T.	P.O.B.	* I.T./Agri. Sci./Spanish	Social Studies
Social Studies/ Spanish	Spanish/Art *	Food & Nutrition	P.O.A.	Electronics
I.T.	History	Clothing & Textiles	P.O.B.	Welding (CVQ)

* Limited Space
Students will not have the option to drop out once they have made their Group choice.

Appendix C

BEST SUBJECT AWARDS

SCHOOL #2

ORDINARY LEVEL

SUBJECT	ACHIEVER
ADDITIONAL MATHEMATICS	
AGRICULTURAL SCIENCE	
BIOLOGY	
CHEMISTRY	
ENGLISH LANGUAGE	
ENGLISH LITERATURE	
FOOD & NUTRITION	
FRENCH	
GEOGRAPHY	
HISTORY	
INFORMATION TECHNOLOGY	
INTEGRATED SCIENCE	
MATHEMATICS	
OFFICE PROCEDURES	
PHYSICS	
PRINCIPLES OF ACCOUNTS	
PRINCIPLES OF BUSINESS	
SOCIAL STUDIES	
SPANISH	
TECHNICAL DRAWING	
TYPEWRITING	

ADVANCED LEVEL

SUBJECT	ACHIEVER
ACCOUNTING	
BIOLOGY	
BUSINESS STUDIES	
CHEMISTRY	
COMMUNICATION STUDIES	
ECONOMICS	
ENVIRONMENTAL STUDIES	
GEOGRAPHY	
HISTORY	
LITERATURE IN ENGLISH	
MATHEMATICS	
PHYSICS	
SOCIOLOGY	

Appendix D

Interview Guide (For Teachers)

Bank of semi-structured questions and probes based on the Research Questions.

How has the Technology Education curriculum been implemented in this school?

How many people were trained to teach Technology Education in this school?

What other measures – other than the training did the government put in place to implement this Innovation at this school?

What happened after your training in 2004 – did you begin to teach the subject right away?

What were some of the difficulties faced at the beginning stages of this implementation?

Do you think these measures put in place by the government were adequate for the implementation of this curriculum at this school?

What were some of the measures that helped you to implement Technology Education?

Are you still excited about teaching Technology Education?

Do you think there is a need for training and re-training?

If yes, in what areas?

Do you think this curriculum is better than the previous one?

What inhibitors, if any, impeded implementation at this school?

Questions to be posed to the principals

1. What were the measures put in place at your school to implement this new innovation?
2. Do you think that those measures are still adequate for implementation?
3. Do you think that the facilities at your school are adequate for the teaching/learning of Technology Education?
4. Are the resources readily available (e.g. funding) for this subject at your school?
5. Do you think that the teachers were adequately prepared for the teaching and assessing of the Technology Education curriculum?
6. Do you think that there is need for re-training?
7. Do you feel that the administrators were sufficiently informed about the change?
8. In your opinion, which is more beneficial to the students, Technology Education or Technical/Vocational studies?
9. What are some of the barriers that have affected implementation of Technology Education at this school?
10. Any other thoughts that you would like to share on the implementation of this curriculum?

Appendix E

18 Citrus Drive

Enterprise

Chaguanas.

21.05.09

To Whom It May Concern

Dear Sir/Madam,

I seek your permission to conduct this interview and to record the responses on a voice recorder. I would also like to take pictures if necessary.

I give you my assurance of anonymity and strict confidentiality.

You retain the right to withdraw form this interview and from participating in this study at any time.

Yours sincerely,

Babsy Kidney

Babsy Kidney.

Appendix F

School #1

The interview 1.

Date: Thursday 28 May, 2009.

Time: 9:00 a.m.

Place: The 'farm'. The farm was chosen to interview because it was a quiet area and the less student traffic and so less interruption would be had during the interviews.

Teacher: #1M

This is a trained teacher who holds a Bachelor Degree in Agricultural Science and a Diploma in Education. He was one of the teachers involved in the Item writing at the initial stages of the curriculum development in Technology Education in 2000. He was also one of those who attended a one month workshop at the 'August Institute 2000' and was accredited with the Diploma in Technology Education by Mount Saint Vincent University.

RQ1
RQ2
RQ3

Interview

Q. Do you teach Technology Education (Tech. Ed.) at this school?

A. No, not at this time.

Q. How many people were trained to teach Tech. Ed. in this school?

A. Three, but they are not teaching Tech. Ed.

Q. As a trained Tech. Ed. Teacher, what measures – other than training – did the government put in place to implement this innovation at this school?

A. No measures were put in place at this school to teach Tech. Ed.. But the former principal (Mr. JM) told us that we had to adopt that subject in the curriculum. So, we started teaching it in 2000, after attending 'The August Institute 2000' workshop which really was an introduction to Technology Education.

Q. In 2000? Even before the training at the Diploma level?

A. Even before the training. A group of teachers seven to eight of us who attended that 'August Institute' at the RCLRC in Couva were told by the former principal – he insisted – that we go the Tech Ed. Route, so we started to teach Tech Ed. from 2000 to 2005 at this school. No additional resources were given to teach the program, we utilized whatever we had in the various departments to teach the program according to how we were trained but very limited. It was done on a limited scale because of lack of resources.

Q. What happened after 2005?

A. in 2005, a new principal came on board and the problems we had over those 5 years, the teachers went to the new principal outlining the difficulties we had in teaching Tech. Ed. Minus the resources and with his blessings we discontinued the program and we went back in the old areas Home Ec., I.A. and Agric Sc., which we have continued until now.

Q. What were some of those difficulties?

A. Lack of resources mainly and the number of teachers – 16 in total – more than half were not trained.

Q. Do you think these measures were adequate for the implementation of this innovation at this school?

A. Well, there were no measures at all because the miniscule training that we got was inadequate number one and we had no resources and there was not a curriculum developed to deliver the subject then, so we just went with the little training we got at that 'August Institute'

Q. Now, at this point in time, 2008/2009, Still no measures?

A. We have had no resources, supplies from SEMP – SEMP I think is the one who is supposed to be the provider for the resources. To this date, we have had nothing. We were promised some lab. Facilities and equipment – nothing came. The principal will update you. I think he was called recently to say that there is something on the way. So we'll wait and see.

Q. But 'that something on the way' was promised when?

A. Well since, ha, - a long time ago – I really can't recall when, may be 2005 or so, when the training was done i.e. the Diploma in Tech. Ed. Was done. I think that was in 2003. So, since then lab facilities were promised. I think a few labs were set up, one in Valencia, so since then promises were made to our school and the other schools and nothing ever materialized.

Q. Did you get funding at that time? /Do you get funding at this time?

A. Well, there is no specific funding for Tech. Ed. there is general school funds that some principals may be willing to provide for Tech. Ed. But it is a very demanding subject in resources so whatever resources were provided, the principal did facilitate at that time to some extent, some of the needs for materials, that is prior to 2005, but, nothing really major to buy things like computers, stoves, fridges, microwaves etc.

Q. To re-start, some of the things that were promised since 2005 and prior to that, do you think they it will come?

A. I am not too sure, with the economic situation facing the country right now – I don't know.

Q. There is talk about sending mobile labs. instead of building laboratories. Do you think that will work? In terms of continued funding?

A. Tech. Ed. puts a heavy demand on resources which is not renewable really so the material cost will be very,

very high and I don't know if the principal will be given that kind of money in his yearly disbursement – I really don't know so continuous funding of this program, I cannot see it happening given the current state of the economy. I really cannot see it happening. The mobile

lab, I have not seen any as yet so I am really unsure what the content is but again from what I been exposed to at one of the pilot schools – I am sure that the mobile lab will fall short in terms of what it contains and we will not will be able to do all the activities that we probably would have in a fully furnished lab..

Q. In 2003-2004, teachers were trained, at that time there was a lot of excitement for Technology Education. In 2009, in your opinion and speaking for yourself, Is the excitement still there or waned or gone?

A. I had my reservations as regard to Tech. Ed. Even at that point when I wrote the initial curriculum (I was part of the team). Yes, the excitement was there, it was a new subject a new dimension in teaching, a new way of teaching in terms of the delivery which I think students would have found exciting but yes the excitement has waned given all the numerous obstacles faced and from then to now and I have had my re-think on the program really because there is no continuity in Tech. Ed. After form three- the program just falls off and students are left hanging in thin air literally. My 'whole take' on Tech. Ed., is that it should be infused into the curriculum across the board. It should be part of all subjects and not separately and that is my re-think on the program where the technology is adopted through out the curriculum.

Q. In terms of the teaching, learning and assessment strategies?

A. Exactly! In all subject areas and not taught as a separate subject.

Q. so what you are saying is that students are 'hanging in the air' at the end of form three and then form 4 what happens?

A. That's it! students are placed with very, very big limitations in terms of moving on because if they have to go on to traditional subject areas like Agricultural Science or Metals or whatever at the upper level, there is no foundation because that has been removed from forms 1-3, so it is like starting all over again and it is an exam that they will have to write in less that a year and two thirds which is the CXC.

The teachers from the Senior Secondary – our main feeder school- for the last umpteen years have been complaining. When we discontinued these programs in 2000, the teachers who got them in the Senior Sec. in 2002-2003, those teachers told me that the results fell very, very short of what was expected or what had happened the year before. The curriculum officer for the subject area told me that the 80% pass rate in Agricultural Science dropped when we started sending students without any foundation whatsoever. From 2003 onwards, the results went down to 20% - the damage was caused because of the introduction of Technology Education and the stoppage of the Tech/Voc areas.

Q. Do you think it was well planned out at the beginning in terms of curriculum planning and development, were these obstacles not foreseen?

A. No. Planning, I think is the last thing that takes place in our country. We normally adopt full scale measures, that is in some foreign land that is well developed and well thought out and we adopt it in our country and really not think about the repercussions or implications. We adopt strategies that are suited for the developed countries for an undeveloped country and our population is inadequately prepared to handle such. So, Tech. Ed. as it is, how it will be implemented here, I do not think it will succeed – it is a wonderful opportunity yes, to teach the method by which the students will actually learn through problem solving but as I said it should be infused into the curriculum across the board rather than being taught as a separate subject.

Q. So, do you think there is a need for training and re-training because so many people weren't trained?

A. Yes. Because many people weren't trained and many people came into the system afterwards so they need to be trained.

Q. In what areas?

A. All the areas! If the training received in 2003 were maintained in the 4 core component areas – yes all those 4 areas need training and re-training because things have changed from 2003-204 to 2009.

Q. You said this school reverted to the Tech/Voc subject areas. Can you pinpoint a few reasons why?

A. Lack of resources, manpower, and the students we have here –we thought it better to give them a life skill – rather than to go down this road and numerous reasons but basically the constraints of resources - the main thing for the delivery of the curriculum.

Q. Do you think at the time, you were adequately prepared for implementing the curriculum?

A. The curriculum was a draft curriculum – that is number one and the level at which it was pitched – yes I was part of the writing team – but honestly speaking the level at which it was pitched I think it would have been unsuitable for the students' ability because basically we have students with low level performance, low ability and if we examine the curriculum – that document did state that teachers could have developed their own activity to suit the level – this was a plus – of the student

Q. Do you think at this time, given all the obstacles, there is a need for other teachers and re-training of all the teachers who was trained before?

A. I have spoken at various levels yes and from what I understood, the training that was received from those professionals were woefully inadequate to say the least. The training did not meet the demands or the needs of the subject as envisaged by the people in curriculum. It was a drastic change. And yes, there was some resistance by me personally. At the time initially – but having being trained – seeing a bit of what it was about, I took to it readily, it became a part of my normal teaching strategies ,a teaching tool. It was a very easy method to implement as long as we had the resources available where the onus was really more on the students and the teachers were not really center stage, it really covered the student rather than the teacher so it is good strategy – a good method. I applaud the desire to teach Tech. Ed. but not along the route that we are pursuing right now.

Q. if there is a mandate to teach Tech. Ed. What will you do?

A. If it is the Ministry's policy to implement the SEMP curriculum with the eight core subject areas and the principal is obligated to follow the mandate of the Ministry .....Well, on that basis I will say yes, we will have to implement the program.

Q. And stop the Tech/Voc?

A. And well yes stop the Tech/Voc.. If it is a Ministry order and yes what we are hearing is that from this year – come September the will be no I.A./Home Ec./Agricultural Science examinations at the NCSE level but it has been replaced by a Tech. Ed.(Appendix...). We will have no alternative from September but to go down that Tech. Ed. Road.

Q. You have no alternative but to go on to implement Tech. Ed. Despite all the inhibitors or obstacles – you still have to do it. How?

A. that is the magical question. Alright, that is what the Ministry has been trying to obtain for the longest while because they want us to spin gold from straw!

Q. Do you think this curriculum is better than the previous one?

A. That question needs some deliberation but I can tell you no real study has been done on the impact of the former curriculum. If one examines the place of work outside there where the technicians are really – where did they come from? I think the Ministry of Education has not really considered how useful the Tech/Voc subject areas have been in training these people for our future farmers, plumbers, technicians, mechanics and even teachers. So I believe the old Tech/Voc department played a critical role in supplying the labor force for that market and again if we did not offer those subject areas at the lower level we would have lost them in society. They would have been drop outs. Tech/Voc taught them a skill so they could fit into society and do something meaningful with their lives. But, with Tech. Ed. the students who are

Benefits of Tech/Voc vs Tech Ed.

low achievers, it is more challenging for them which leads to a lot of frustration for everybody. So the Tech/Voc area is better or more beneficial to the students.

Q. Any other inhibitors do you think would have impacted on the implementation of Technology Education at this school?

A. One basic human nature is to resist change – you did not have teachers in the department – especially the older ones, the ones on their way out – resisting the change. Change is a natural phenomenon, we know that but we did have that as a problem. I think that will still be a problem unless we have a total re-training and re-tooling.

Thank you for your time and valuable comments.

Interview 2

Date: Thursday 28 May 2009

Time: 10:30 a.m.

Place: The 'Farm'

Teacher: #1A

This is a trained Agricultural Science Teacher and has also been on the one month training in Technology Education at the 'August 2000 Institute'.

Q. To you as an Agricultural Science teacher at this school what difficulties did you have with respect to the stopping of Agri. Science and implementing Technology Education?

A. Well first of all when we went to The August Institute 2000 and we came back to our school I assumed that we were one of the 'pilot' as well and from what I recall the former principal Mr.JM. said that we have to convert to Tech. Ed. With whatever we had –which is what we did.

Q. And what did you have?

A. Nothing! We had the farm! Which we always had because we taught Agri. Sc./ Home. Ec. And I.A. at the time it was something new, it was a challenge. To me the research and thing was nice but we had nothing so I had an adapted 'thing' to meet the requirements of the objectives.

Q. And then?

A. After that now, things got harder and harder, because you are not getting this and you aren't getting that and we had to use our own stuff or buy with our own money –those kinds of things. We had no lab- a lab was promised.....everything was promised.....

Q. Since then?

A. Since then, we said that we will 'work' it in our area. We had the farm so we decided to do bio-technology – that was easier said than done, but we continued with it until eventually that was phased out and we said that we teaching in our area –our subject – back to the same old thing and then we eventually got a new principal who said oaky so we went back to before 2000 and to teaching our separate subject areas.

Q. In your opinion, which is more beneficial to the student – the Tech/Voc subjects or the Tech. Ed.?

A. From what I understand, Tech. Ed. is supposed to be a way of doing something, a problem solving way, with critique and critical thinking skills and I think that should be applied to every subject area. Why is it a separate thing? As far as I am concerned Agri. Science is not inefficient! It was never inefficient in any way! Why they brought Tech. Ed. and why are they going to take out Agri. Sc. . It did not fall short in any area. Our students passed at the CXC level – I'm not talking about 'our' students, I'm talking about in Trinidad, the children passed! They did well! They learnt something whether they did it as a career eventually when they became an adult they will remember and use it – I remember. When I did it in Forms 1-3 – I did not do Agri. Sc. in Forms 4 & 5 but I did it at University and I was able to remember and recall and use it. I do not see this subject as being inefficient in any way. I do not know the rationale to remove it in the first place.

Q. Do you think that the tasks in Tech Ed. are too time consuming?

A. Yes

Q. How?

A. I do not think one project should last a term, half or even quarter term. That is a lot! I don't think the kind of children we are getting will follow like that!

Q. Do you think they will get bored?

A. Besides bored, we don't have the facilities to say that we'll go back to the lab and we'll continue where we left off. It is not like that. They forget their stuff home, they lose it then we have to find things all over again. The kind of students we get here are the lower level (30% and below), if we get those above 30% they are barely there and many cannot read and write or do anything!

Q. Have you seen or heard from the curriculum officer during the last nine years?

A. Initially right after the August Institute we met with one – I cannot remember her name.

Q. But over the years and now?

A. No

Q. Do you know who the curriculum officer is?

A. I do not know anything about Tech. Ed. at this point in time. I teach Agricultural Science.

Q. But do you know who to call?

A. No! I have no inclination towards Tech. Ed. to be honest. I am disillusioned by it. I felt it is a waste of money. Whoever came up with that should..... as a separate subject for selected schools, for instance where it could be applicable but not something every child or every school should do.

Q. Do you think there is a present need for training / re-training of teachers?

Need for training/Retraining

A. I do not think a one - month training (at the August Institute) is enough to make me a teacher of Technology Education. It was really an introduction of what they were trying to implement. That is all it was! The people who went on to the Diploma thing got training. And the people who were not what do we do? Yes, I have an idea but to me I feel Agri. Sc. is my area (of expertise) I am a trained teacher of Agricultural Science! I do not want to change that!

Thank you for your time and interesting comments.

Interview #3

Date: Thursday 28 May 2009.

Time: 11:30 a.m.

Place: The Principal's office.

Person: Principal #1.

This principal did not want the interview to be recorded so I took notes as the interview went along. He had strong views or feelings against the teaching of Technology Education at this school.

Q. Is Technology Education taught at this school at this time?

A. No!

Q. Why?

A. Because Technology Education did a lot of damage to the educational system in the area of Technical Vocational education. It is a total mess because of what Tech. Ed. has done.

Q. What do you mean by 'a total mess'?

A. Tech. Ed. was supposed to have happened but there was no facilities yet the teachers started teaching it resulting in a tremendous loss to the Tech/Voc subject areas which were left 'hanging' in space. When I came here in 2005, the issue came up and as a whole staff, a decision was taken to stop teaching Tech. Ed. and go back to teaching the individual areas. The result was a full turn around. The teachers had a positive attitude once again and the students who did the individual areas were motivated to return to classes. Previously, the students used to be 'breaking' classes but because of the practical aspects in all the areas of Home Economics, Industrial Arts and Agricultural Science they stopped and started to attend classes once again. Listen, nobody the teachers, the curriculum people, nobody seemed to know what they were doing in Tech. Ed. - there was a lot of uncertainty. Therefore, I could not develop any confidence in Technology Education.

In 2006/2007, I attended a meeting on Tech. Ed. and we were asked to voice our opinion. I told them of my concerns and the Curriculum Officer at the time said my fears and concerns were unfounded. But, I still did not agree with them!

Q. were you invited to any workshops to apprise administration of what Technology Education entails?

A. No. I was not invited to any workshop. There was a training workshop for teachers not administrators.

Q. How many teachers were trained?

A. About four teachers.

Q. Do you think that was enough to implement the curriculum?

A. No.

Q. What are your present needs if you are to implement the curriculum?

A. We need everything. Facilities; funding; training. I hear they are sending Tech. Ed. carts next week. I do not know what is involved and how it will improve the present curriculum.

Q. Which do you think is more beneficial to the student? Why?

A. Tech./Voc because here the student will develop skills that he could market. In the Tech. Ed. approach the student could work in a group and still be lost, he would not come out with any kind of skill. What is the end product of this subject? Many students will not develop any necessary skills for the job market!

For example in Food and Nutrition, when the student is finished with this course she or he has a certificate which states that this person is skilled in baking or whatever but what does Tech. Ed. certify the student to do?

What kind of recognition does Tech. Ed. have in the National or even International community or the business community? Do they know what a child with a certificate in Technology Education can do as compared with a Technical Vocational subject? They need to know.

Q. There is a mandate to start Tech. Ed. in September. What will happen then?

A. Our focus is on CXC not NCSE which has no worth when he leaves school. Therefore, the focus will be on teachers using the Tech. Ed. approach in their individual subjects.

Q. Why?

A. Because the students will not have enough time to study these subjects with one year in form four and one term in form five. Remember these are students who scored less than 30% in the SEA. And therefore they need a lot of foundational work in the early years of forms one to three and then they may be able to perform better at the CXC level.

Q. Do you think Tech. Ed. will work in Trinidad and Tobago?

~~A. Never~~!

~~Q. Why~~?

A. ~~Because Technology Education will not produce the kind of personnel that Industry requires or the World of work require~~s.