

TEACHERS' EXPERIENCES IN THE IMPLEMENTATION OF THE TECHNOLOGY  
EDUCATION CURRICULUM IN ONE SECONDARY SCHOOL IN THE ST. GEORGE  
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## ABSTRACT

This paper reports on the findings of a study of the experiences of teachers in the implementation of technology education in Valley View High School. The study seeks to examine the facilitating and inhibiting factors which teachers have experienced. The strategies used in coping with the innovation were also included. A purposive sample of three teachers was selected to represent the population which consisted of three main disciplines. The sources of data collection were interviews, observations and document analysis. The data were analysed using the constant comparative method. The findings reveal that the Ministry of Education represented by curriculum officers facilitated the process. There were many challenges faced which primarily focused on the disparity in the subject content knowledge, content purported by the two different training bodies and management of limited resources. The need for appropriate timetabling, creative coping strategies were unearthed in the study including the reallocation of limited space to create a laboratory.

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## **Chapter 1- Introduction**

### **Background to the Study**

Technology Education is emerging as a program of study which is an essential part of the general education of all students. It is aimed at developing problem solving and critical thinking skills, to encourage the development and use of new technologies. Therefore, educating young people for sustainable development has become increasingly important to most educators around the world, this concept being an impetus for the introduction of Technology Education.

Technology Education plays a significant role in promoting and sustaining production and consumption (Hamilton & Middleton, 2001). Technology Education has been introduced, in several countries around the world, with each country experiencing varying facilitating and inhibiting factors. In this study an international overview of teachers' experiences in Technology Education implementation is valued.

### **An International Perspective of Technology Education Implementation**

#### **The Australian Experience with Technology Education Implementation**

Australia's contribution to the development of technology education was recognised as significant in 1989 when the Australian Education council agreed to a statement, known as the "Hobart Declaration" which recognised eight national key learning areas which must form the foundation of a child's schooling (Hamilton & Middleton, 2001).

Australia has been one of the forerunners in the implementation process providing a model for many other countries to follow. Research indicates that during the implementation of technology

education teachers were faced with many intrinsic and extrinsic challenges in Queensland, Australia. Some of the challenges faced by these teachers were reviewed.

### **Challenges to Implementation in Australia**

It was noted that the teachers' knowledge and understanding of the subject matter knowledge, curricular knowledge and pedagogical content knowledge was limited (Stein et al; as cited in Banks, 1996).

Also mentioned as challenges to implementation were limited teacher and student resources, availability and management of timetabled time and finding suitable assessment strategies (Finger & Houguet, 2007).

It must be noted however that there were factors affecting technology education implementation in Australia.

### **Factors that Facilitated Implementation in Australia**

The waning interest in Technology Education by students, though appearing to be a negative factor proved to be a vital catalyst for change. The introduction of a new curriculum was propelled by students' declining interest in the subject. A new curriculum which facilitated the students' context was therefore an impetus for teachers to implement with improved attitudes to this innovation.

Another driving force for implementation was the positive impact that countries overseas had on teachers in Australia. New Zealand had recently moved in another direction to implement a new curriculum, this country in particular impacted neighbouring Australia's teachers positively as they responded to their own change process.

The overall supportive school environment or climate was another facilitating factor which encouraged the implementation of Technology Education in Australia. The internal school political milieu appeared to have supported teachers in implementation. The individuals contributing to this environment were the principal, head of department, technology staff, school council and parents. Teachers felt a freedom to embrace change because of this supportive administration.

Teachers in Technology Education who were a part of the change process found that engaging in a practice of personal reflection and development changed their beliefs. It was initiated by career dissatisfaction, influence of peers or mentors, further study and spiritual enlightenment. Teachers' personal renewal resulted in the development of new beliefs knowledge and skills in Technology Education.

In addition to personal renewal, other personal characteristics of teachers dictated the response of the participants when impacted by other factors. One characteristic is the teacher's leadership style. The style adopted impacted the success of the implementation process (Barnes, 2005).

### **Technology Education Teachers Transitioning Experiences in New Zealand**

New Zealand is one country whose emphasis in technology has impacted the schools' curriculum through the teaching of Technology Education. The major advances in technology have created dramatic changes in emphases adopted by many economies e.g. New Zealand. "New Zealand has, of necessity, moved away from its dependence on dairy, meat and wool exports, as the new industries of forestry, horticulture, fishing, manufacturing and tourism have become more significant (Department of Statistics, 1999). These changes, together with the huge

advances in the associated technology, have created dramatic changes to our economy, and consequently, the fabric of New Zealand society” (Reid, 2000). As New Zealand made strides to produce a more technologically literate society many challenges with the implementation of Technology Education in schools emerged.

### **Challenges to Implementation in New Zealand**

Some challenges and risks to implementation of technology education in New Zealand included the overall perception of Technology Education.

There was a general lack of understanding and consequent undervaluing of Technology education. A commonly held view is that “technical education should be seen as a vocational rather than academic subject or as a subject entirely concerned with skills rather than knowledge” (IPENZ, 2001).

This restricted view of Technology Education also was evident as some viewed technology as ICT alone and that use of computers as an educational tool is technology education. These views held by members of the community and some school principals resulted in barriers to successful implementation.

The challenges continued as other new innovations were introduced and took precedence over Technology Education. There was a shift to other new curriculum areas. While the Ministry continued some support, many schools had shifted focus to other issues and thus neglected technology education.

Inhibiting factors included the need for further development of teachers to assist them in the transition from past practices to those which are more consistent with the curriculum. This



challenge when not addressed resulted in some teachers adopting a negative attitude, resisting the implementation of technology education (Reid, 2000).

The lack of understanding of progression pathways to tertiary education and careers has been identified as a barrier to implementation. The achievement of the prescribed standards in technology to provide students with the necessary competencies was also a challenge. There were also factors that led to easier introduction of Technology Education as an innovation.

### **Factors that Facilitated Implementation in New Zealand**

New Zealand's technology curriculum is regarded as leading-edge. New Zealanders have made direct inputs into the development of curricula in USA, Hong Kong, South Africa, Finland, and Chile. Features of the New Zealand Technology curriculum which have drawn particular attention are: - the broad concept of 'technological literacy', the coherent nature of the curriculum, which gives explicit recognition to technological knowledge and practice and to societal elements rather than focussing more narrowly on 'design and make' and technical skills and the inclusion of technologies with particular reference to Bio Technologies.

Available resources have been provided through small grants from voluntary organisations (The Institution of Professional Engineers New Zealand, 2001).

### **Nigerian Teachers' Experiences during Implementation of Technology Education**

Nigeria a developing country also experienced challenges with their introductory Technology curriculum. Olaniyan & Ojo (2008) have documented the challenges teachers faced in the implementation of the Introductory Technology Curriculum in Nigerian Junior Secondary

Schools. They identified key areas of concern to teachers. One of these challenges is the lack of or non-availability of functional workshops. The lack of resources including instructional materials, textbooks and training manuals are other challenges experienced by one third world or developing country Nigeria.

### **Caribbean Countries focus on Implementing Technology Education**

CARICOM, made up of many third world nations, regards technology education as essential for developing countries, as it will facilitate growth in the economic and social sectors helping to address under employment and unemployment and reduce dependence on foreign imports. Gift et al. (1999) developed a Curriculum Guide for Technology Education for Primary and Secondary Schools in the CARICOM .They were commissioned to do so by the CARICOM secretariat which was prompted by the CARICOM Heads of government in 2002. They conducted a series of training workshops in the Caribbean. This was funded by the Commonwealth Secretariat. The workshops were devoted to inducting education personnel from all of the CARICOM into developing and implementing curricula in technology education. The school levels targeted were primary and lower Secondary students (Gift & Subran, 2002).

### **The Reasons for Introducing Technology Education in the Caribbean**

Leaders in the Caribbean being visionary as they charted the course of their own countries realised that teaching technology education in schools would encourage the growth of their economies based on the application of knowledge. It was hoped that Caribbean countries

would produce firms that are more competitive in the global economy, since technology has become driving force behind economic transformation. This technological thrust would prepare the citizenry to cope with future career changes as well as sensitizing individuals about the harmful effects of some technological advances (Gift & Subran, 2002).

In the workshop on piloting Technology Education Curriculum, the facilitators also highlighted some possible concerns which could arise during implementation.

### **Challenges faced by CARICOM Countries**

Some implementers, namely teachers may experience a lack of clarity or false clarity about the features of this innovation. Many may assume a very conservative approach desiring to just maintain the status quo desiring no drastic transformational change. The dynamic nature of the classroom situation may cause teachers to be overwhelmed with the huge range of responsibilities they must fulfil on a daily basis, in addition to implementing a new innovation, technology education. This may lead to isolation and feelings of hopelessness in addressing circumstances beyond the teacher's control.

### **Facilitating Factors Envisaged by CARICOM Countries**

There are some elements in the intended implementation process which may assist the teacher. Thorough, effective communication between curriculum designers and implementers is one of them. Teachers will also have a relative advantage because they will receive training and professional development with no expense incurred to them. (Gift & Subran, 2002) .Given the importance of technology and despite possible barriers some Caribbean islands proceeded with the introduction of Technology Education

## **Trinidad and Tobago embraces Technology Education**

Trinidad and Tobago as a CARICOM country convinced of the importance of teaching technology education in schools and sought to implement it, as early as 2001. The National report on the Development of Education in Trinidad and Tobago (2004) stated that education in general should equip the learner with the necessary skills and competencies to function effectively in the social and employment arenas.

Technical and Vocational Education contributes by providing opportunities to develop technological competencies, skills related to specific occupations. In 2001 the general council of UNESCO resolved that all children up to the age of 16 should be given the opportunity of accessing a quality education of which technical vocational education is pivotal.

The Ministry of Education, realising the merits of technical /vocational education in preparing young people for the world of work, introduced Technology Education as a core subject in the transformed secondary school curriculum, which was developed under the SEMP. The Ministry of Education, as part of this modernisation and expansion of the education system in Trinidad and Tobago and in recognition of the rapid changes in technology that characterise the information age, has decided to introduce technology education into the national secondary school curriculum. Technology Education is one of the central elements in the modernised core curriculum (SEMP Secondary School Curriculum, 2008).

“The Technology Education subject encompasses the basic principles, content, skills and attitudes afforded by the study of several technical areas including Information technology,

Agricultural Science, Home Economics, Industrial Arts and Business Studies” (National report on the Development of education in Trinidad and Tobago August, 2004).

This report went on to state that exposure to technology education at the Form one to three level will prepare students to choose from as many as fourteen related subjects offered at the CSEC level.

The Ministry of Education embarked on a number of strategies to aid in the implementation process, one of which was the professional development of teachers. The training began in 2003 up to four cohorts were trained subsequently totalling one hundred and twenty teachers who received a diploma in technology education. Many of these teachers have not been able to register students from their schools for the NCSE examination.

Technology Education was first introduced into the curriculum in 2001, to replace three subjects, Industrial Arts, Home Economics and Agricultural Science, at the lower secondary level. Subsequently, the areas of Business and Information Technology were included under the banner of Technology Education thereby catering for all schools including denominational and government schools.

As a result of consultations with key stakeholders including experienced teachers, the previous curriculum framework was discarded and a new curriculum guide was produced with different components and subcomponents with more culturally appropriate activities and an overall reduction of the content by 50%. Another concern raised about the content knowledge resulted in the Course Outlines being removed and replaced with Challenges and Specific learning Outcomes (SEMP Secondary School Curriculum, 2008)

In February, 2009 a memorandum was sent to all secondary schools stating that the NCSE examination for Form three students would be in area of Technology Education and not

Agricultural Science, Home Economics or I. A. It further stated that all schools would be required to register for the examination.

In June 2010, 4125 sat the examination, 61 out of 144 secondary schools participated in the NCSE examinations (Report on NCSE examination results, 2010). This indicates a low level of implementation of the Technology Education Curriculum.

### **Statement of the Problem**

The vision for technology education outlined in the curriculum guide states that “Technology Education for Trinidad and Tobago will help to develop students who are technologically literate, creative and innovative and be able to use technology to communicate effectively” (SEMP Secondary School Curriculum – Technology Education , 2008).

However based on the discussions at workshops and NCSE standardisation meetings, as well as informal discussions with curriculum officers, and the evidence that many students are not writing the NCSE examinations in this subject, it appears that teachers are hesitant to implement Technology Education. This warrants some investigation as to whether teachers’ experiences show fidelity to this vision. The reality is there has been little research on teachers’ experiences during implementation of the Technology Education in Trinidad and Tobago.

### **Purpose of the study**

The purpose of this study is to gain insight into the experiences of three teachers (enquiry into these experiences will focus on the barriers and facilitating factors they are

experiencing) in the implementation of Technology Education in one secondary school in Trinidad.

In this study I will seek to unearth strategies utilised in overcoming challenges experienced during the implementation process.

### **Research Questions**

#### **Over arching question:**

What are teachers' experiences of the implementation of technology education at Valley View Secondary School in the St. George East District in Trinidad?

#### **Sub- questions**

1. What factors, experienced by teachers, facilitated the implementation of technology education in this school?
2. What factors, experienced by teachers, inhibited the implementation of technology education in this school?
3. How have teachers' experiences with the implementation of Technology Education informed their pedagogical strategies in the classroom?

#### **Definitions of Key Terms**

The introduction of Technology Education to the schools' curricula is relatively new as compared to other disciplines .It is therefore imperative that it be defined to engender clarity and reduce confusion.

## **Technology**

The definition of technology which is widely accepted is "The know-how and creative processes that may assist people to utilise tools, resources and systems to solve problems and to enhance their control over the natural and manmade environment in an endeavour to improve the human condition" (UNESCO, 1985).

## **Technology Education**

“Technology education is a comprehensive, experience based, educational program for students to know about, do and value technology” (Wright et al., 1993).

“Technology Education is being concerned with identification of the needs of people and endeavours to satisfy those needs by application of science and the use of material resources and energy. It is concerned with solving problems. There are no right or wrong answers, only good or bad solutions to problems” (Cross and McCormick, 1986).

## **Curriculum Implementation**

Curriculum implementation can be considered to be the process of enacting the planned curriculum (Marsh & Willis, 2007).

## **Innovation**

An innovation is an idea, practices, or object that is perceived as new by an individual or other unit of adoption (Rogers, 1995).



### **Significance of the Study**

The study is significant in that it would assist stakeholders in understanding facilitating factors and help them to address inhibiting factors to implementation.

The information gained including coping strategies can be used to inform school practices and policies related to implementation of future innovations in this context. It could assist change facilitators in effectively planning for further profession development training. It would contribute to the existing body of literature in this field.

## **Chapter 2- Literature Review**

There are changing patterns in the social, political and economic organisation of human activity that transform our cultural practices and alter our vision for ourselves and for society. The rationale for changing curricular is deemed necessary when existing content, methods and structures of the school education do not seem to be responding to new social demands resulting from cultural, political, economic and technological changes that inform new visions (Tawil, 2003).

### **Philosophical and Theoretical Perspectives on Curriculum Implementation**

The implementation of Technology Education can be considered to be an innovation for which the implementation in secondary schools would have been impacted upon by the change process. Fullan (2002) conceptualizes curriculum implementation as entailing three possible types of objective change, that of change in materials, change in practice and change in values and or beliefs.

The understanding of change theory is paramount to understanding the adoption and implementation process of any innovation, but in this case technology education.

In Australia, the implementation of Technology education into secondary schools has major implications for teachers, students and school administration. These implications include changes in the philosophy underpinning the subject, as well as the teaching and assessment strategies used. An 'ideal' technology education program would be one that highlights the socio-cultural aspects of technology. It should develop problem solving skills and abilities to integrate systems of technology with group based activities

to foster development of communication skills. It should form part of general education of all students at all levels and it should have a cross-curricula potential (Hamilton & Middleton, 2001).

They also found that implementation in technology education is enhanced by, teachers having access to and participating in a high quality in-service training. It is facilitated by appropriate facilities and equipment, support from the school's administration, an adequate budget for continual improvements to the facilities and equipment purchases. In Australia it was found that actively marketing and promoting the subject to all stakeholders assisted with successful implementation. They also reported that the involvement or participation of teachers in the development of the curriculum the more likely it was to be adopted.

The history of Educational reform and innovation is sated with ideas and policies that fail to get implemented or that may be successful in one context but not another. Fullan (2002) identified the missing ingredient as a lack of understanding and insight about the change process and the drivers that make for successful change in practice. . Teachers' experiences, particularly the challenges faced in the implementation of a new innovation may be influenced by their lack of knowledge of the change process (Fullan, 2002).

### **Curriculum implementation demonstrative of the change process**

Hall & Hord (2001) states "Change is a process, not an event. In other words, change is not accomplished by having a one-time announcement by an executive leader, a two- day

training workshop for teachers in the August.” They continued, “Change is a process through which people and organisations move as they gradually come to understand and become skilled and competent in the use of new ways.”

The discourse also highlighted differences between what is entailed in development and what is in implementation of an innovation. “Development entails all of the activity related to creating an innovation, while implementation addresses establishing the use of the innovation in adopting.”

Teachers need to be cognizant of the fact that an organisation does not change until the individuals within it change. There is an individual aspect to organisational change. Individuals exposed to an innovation may implement at different rates. Rogers spoke of early adopters and laggard the slowest set of individuals to participate. Leaders need to anticipate and facilitate the individual aspect of change.

The nature of the innovation i.e. it comes in different sizes, is a crucial change principle. Most individuals focus on what is to be changed without considerations to the time, resources and effort required to implement the innovation. It should be considered that in many instances one innovation may require several smaller innovations to be included in the process.

Interventions are the actions and events that are keys to the success of the change process. The focus is usually on the innovation but there are many events e.g. training workshops which are deemed necessary, these are called interventions. One legged interviews are also a possible type of intervention as a principal and teacher may speak on the corridors for a few minutes.

There will be no change in outcomes until new practices are implemented. In some schools the pressure is placed on the teachers to improve examination results to ensure no child is left behind and the support structures are not in place to effect the change and the associated results. If the support structure then takes years to be introduced then the effectual change will also be delayed.

Administrative leadership is essential to long-term change success. Many teachers are advocates of the fact that for change to be effective it must start from the “bottom up” and that the implementers are the ones who are ‘on the ground’, who know best about the needed practices and products. However many a research has shown that if administrators in a school are not “sold on the innovation” it won’t have any lasting effect.

One type of intervention utilised in implementation is strategy and one type of strategy is giving a mandate. Mandates have been continuously criticised because of the autocratic, top down approach, but they can work. Mandates have been given a bad name because they have been issued in isolation. For these to truly have a beneficial impact they should be reinforced through follow up with effective and open communication, through continuous training and sufficient time for the implementation to work.

Even though the dynamics of the individual is an important factor in the change process, the pivotal entity for making change successful is the school. The staff and administration at the school are the ones who ensure that an innovation is successful or whose lack of support results in its failure. The school is part of a community and an education system. The school must move in tandem with external bodies to receive the resources and all necessary support for the proper functioning of the organisation.

Central to successful implementation is the team effort required by all in the policy to practice continuum. The nature of the role played by each individual or each group of individuals has a great influence on the dynamics at the site of implementation. The Minister of Education, the chief education officer the director of curriculum development as well as colleagues in the school all have a crucial role to play in implementation of any innovation.

The school context is also a crucial part of the change process. The physical structure, the available resources and space, as well as the attitudes, belief and values of the individuals, i.e. the people factors are key in forming a supportive environment.

One of the major aspects of change has to do with reducing resistance to change. The first stage is to ascertain the reason for the apparent resistance. It may be the fact that individuals were in their comfort zone and now they have been asked to stop doing what they knew best. Resistance to change may be linked to the concerns individuals have about whether the change is really an improvement on what was there before. The other reason may be it is just painful, which is a natural part of the process (Hall & Hord, 2006).

As one focuses on the school context impacting the change process, especially people's attitudes, beliefs and values the concerns based adoption model demarks several stages an individual may experience during the implementation of an innovation.

### **Hall and Hord's (2001) Concerns-Based Adoption Model (CBAM)**

The model has seven stages of concern that an individual moves through sequentially in the process of adopting and implementing an innovation. These stages have major implications for successful implementation. The concerns model identifies and provides ways to assess seven stages of concern. They point out the importance of paying attention to where individuals are and

addressing the questions in a timely manner. This is of importance to the study as one tries to address teachers' experiences which will include their concerns. Often, we attempt to deal with the pedagogical practices before addressing self-concerns. This model indicates that teachers should be comfortable with the materials and strategies before teaching students. The kinds and content of professional- development opportunities can be informed by ongoing monitoring of the concerns of teachers. This model suggests the importance of paying attention to implementation for several years, because it takes at least three years for early concerns to be resolved and later ones to emerge.

Teachers self concerns have to be addressed, management concerns as well and new strategies to teaching, require practise, all of these need adequate time to be addressed.

Considering, the demands on teachers, once teachers have developed a routine it is difficult to initiate change, as well as stimulating interest and concern about specific student learning outcomes. We also know that everyone has concerns-for example, administrators, parents, policy makers, professional developers-and that acknowledging these concerns and addressing them are critical to progress in a reform effort

The nature of teachers concerns can be considered as barriers to implementation of the Technology Education curriculum if they are not addressed, hence the appropriateness of this theoretical framework for the study.

The initial stage of concern is awareness where teachers demonstrate little or no interest in the innovation. The first stage is Informational where teachers show an interest and would like to know more about the innovation. The personal stage where the question is asked "How will

this affect me?” is the second stage. Then the management stage where the concern exists about the teacher spending a lot of time getting material ready and the consequence of the introduction of the innovation leads the individual to ask “how is my use affecting learners and how can the impact be refined? The need to collaborate and integrate what the user is doing, with what others are involved in makes one realise the next stage of concern. The last stage is refocusing as the teacher generates ideas that can work even better, than the ones currently employed.

### **Levels of Use of the Innovation: Typical Behaviours**

The Levels of Use of an innovation could also be used to evaluate the degree to which teachers have implemented the Technology Education curriculum. It could also provide valuable information which may lead to possible facilitators and barriers.

It could be divided into two categories the levels of non-use and use. Non use included orientation as well where the implementer stage is taking the initiative to learn more of the innovation but still has not used the innovation. The third level is mechanical where the focus is short term and designed to meet the needs of the user not the client. The use of the innovation is disjointed and superficial at this level. The next level is where there is a routine use of the innovation it is stabilized and few changes are being made and little attention is being given to improving the use or the consequences. The refinement level is where the user varies the use of the innovation to increase the impact on clients. Integration occurs when the user combines his efforts with those of colleagues to have a greater impact on the students. The highest level of use occurs at the level of renewal where the user evaluates and seeks to make major modifications to the innovation to increase the impact on students the user explores new goals for him and for the system.



It is therefore important to examine what exactly is the innovation which is being implemented.

### **Subject Philosophy**

Technology Education is informed by two main philosophical streams in education experimentalism and existentialism. These streams suggest that each individual has two critical areas of responsibility to self and to the society.

Student's experiences of an ever changing real world of problems are to be discovered and solved. Technology Education is therefore a process curriculum aimed at developing techniques and skills and promoting positive behavioural change, rather than a product curriculum that is attempting to achieve coverage of a circumscribed set of facts and concepts (Tech Ed. Curriculum guide, 2008).

### **Vision for Technology Education**

Technology Education for Trinidad and Tobago will help to develop students who are technologically literate, creative and innovative and able to use technology to communicate effectively. Students will function as competent productive citizens responsive to the demands of a technologically changing society.

### **Rationale for teaching Technology education**

Success in the 21<sup>st</sup> century global village will demand skills and attitudes towards technology that must be encouraged, supported and facilitated through various components of formal education. Technology Education is critical to this process (*Tech Ed. Curriculum guide, 2008*).

It has intrinsic value; it has educational relevance as it fosters the development of problem solving and critical thinking skills in the context of real world problems. Authentic learning opportunities can be sought.

It affords for the integration of the curriculum across disciplines (*Technology Education the curriculum Perspective 1998*).

### **Goals and Purpose of Technology Education**

In view of the nature of Technology and the Trinidad and Tobago context, program of Technology Education should aim to produce citizens who possess technological literacy, awareness and capability, through a knowledge and understanding of technology history principles, processes, methods, material, tools etc. (*Report of the committee on Technological Studies appointed by the minister of education, 1993*). It was envisaged by the early pioneers of Tech Ed in this country that students would develop the ability to use design, research and problem solve for the use and creation of technology to satisfy human wants and needs and extend human capabilities. It was hoped that an appreciation of the impact and consequences of technology on the individual, community as well as the environment and sensitivity to values would be an integral part of the development of students.

Technology education was to be integrated with other disciplines e.g. mathematics, numeracy skills, measurement skills and graphical skills. Students after being exposed to the curriculum were to develop the ability to create and exercise rigour, imaginative insight and the ability to critically assess and participate in a rapidly changing world.

## **Pedagogical Strategies used in the Technology Education Classroom**

According to Williams & Williams (1996) several basic features of pedagogical strategies need to be observed in teaching Technology Education.

Students need to be encouraged to use self regulation through a concerted effort and particular attention paid by the teacher. Teachers need to be making explicitly clear the appropriate way of thinking students need to use which in most cases is not verbalised by the teacher e.g. “asking the class what to do next” is a strategy that will cause them to evaluate, a good solution , one that needs be abandoned, one that needs to be explored etc. These decisions are normally made by the teacher but it is an important aspect of teaching students problem solving.

Another pedagogical approach is for teachers to be aware of the possible ritualistic nature of using an algorithm to represent the design process. Students may carry out the steps in the tasks with little or no reflection on the steps especially since the steps are the same for each activity. Students pay little or no attention to order in which the steps are carried out and as well as he specific nature of the steps. Teacher should have a variety of ways of approaching the task which involve a considerable amount of designing and making i.e. problem solving and if general steps are used students must be allowed to reflect on these steps.

Teachers must utilise strategies that support problem solving, whether they focus on the general problem solving, global problem or emergent problem. If the teacher uses the design process, the teacher may apply variation in the way tasks are explored. They may start a design and make activity at different points e.g. start with the solution and determine whether or not it solves the problem.

There are many specific strategies which may be used by teachers in the teaching of Technology Education.

Problem solving activities need to be collaborative i.e. they require joint outcomes. Sometimes problem solving activities could be supported by other strategies. A contrast can be made between capability tasks i.e. design and make tasks and a resource task that provides the specific design skills, practical skills or conceptual knowledge needed to carry out the capability task.

Group work is a strategy that underlies many other strategies; it may be considered a learning strategy to develop conceptual understanding and procedural knowledge. Technological activity is by nature a collaborative process. Students should be allowed to adopt various roles e.g. group leader etc. They should develop strategies for agreeing on decisions, voting, consensus building, and giving decision making power to an individual. Students can be taught how to record and share information, through note taking, meetings, reports and drawings in groups and how to form groups by equitable distribution of the various strengths. Students should be graded on their participation in the group rather than the overall product of the group.

Practical investigation which may include for example the choice of materials to make the project or to evaluate the performance of a model, or the testing of operations of the finished product is another strategy, seldom found in Technology Education classroom.

Discussions which are deliberately structured by the teacher are strategies which may be used in the classroom. These should start with a clear stimulus from the teacher, topics headings and should be organised in group. Clear guidelines of what is to be achieved.

The use of role play, games and simulations can be used by the innovative teacher. These can be used to add authenticity to the challenges posed to students. They can be used to introduce activities and topics that are not covered by design and make tasks.

For more mature students where the motivation comes from a need to know basis associated with design and making independent study can be utilised. The use of homework assignments for supporting elements of the project may also be valuable.

Since Technology education is a new discipline there has been no research conducted specifically on the implementation process. Therefore this study will add to the body of knowledge on this topic available in the Trinidad and Tobago context.

## **Chapter 3 - Methodology**

### **Introduction**

A research methodology or design is essentially the logic that links the data to be collected and the conclusions to be drawn to the initial research questions (Yin 2007, p.34). This research used the qualitative approach in the tradition of a case study.

### **Justification for using The Qualitative paradigm**

A qualitative approach to this study is appropriate because of the nature of my research questions. These seek to understand what is going on in the natural school setting as it relates to Technology Education implementation. In this study the researcher sought to investigate and derive meaning from what already exists, rather than look for comparison of groups and cause and effect relationships etc. which typify a quantitative paradigm.

The overarching research question which directed the study was:

What are teachers' experiences of the implementation of Technology Education at Valley View Secondary school in the St. George east district in Trinidad? The sub questions which focused the study were as follows:

1. What are the factors experienced by teachers that facilitated the implementation of technology education in this school?
2. What are the factors experienced by teachers that inhibited the implementation of technology education in this school?

3. How have teachers' experiences with the implementation of Technology Education informed their pedagogical strategies in the classroom?

Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. As the researcher I attempted to build a complex, holistic picture, analyse words, report detailed views of informants, and conducted the study in a natural setting (Creswell, J. 1998).

Qualitative researchers are interested in understanding the meaning people have constructed that is how they make sense of their world and the experiences they have in the world (Merriam, 1998 p. 6).

This qualitative study focused on process, meaning and understanding; through teacher's experiences. The product of this qualitative study was richly descriptive. Words have been used to convey information about the phenomenon.

In my study I sought to achieve a deeper understanding of teachers' experiences as they implemented the technology education curriculum. To understand this I collected information from the selected teachers on the facilitators and barriers they faced and some strategies employed to enable successful implementation at this school.

The experiences varied from teacher to teacher and are valid only in this specific context, the school under inquiry. The qualitative approach was suitable because it focused on the individual's subjective response, as applied to generalised objective reality, and allowed

me to explore individual experiences in some depth, to produce rich thick data. Research states that one should “use a qualitative study because of the need to present a detailed view of the topic” Creswell (1997).

As the researcher, I was the primary source of data collection and analysis. This allowed me to be responsive to the context so that techniques e. g. interview questions could have been adapted to receive greater depth of information. One was able to process data immediately to clarify as the study progressed (Guba & Lincoln as cited in Merriam 1998).

This methodology was deemed appropriate for this study as it provided detailed descriptions and analysis of a bounded system, for the investigation into teacher’s experiences of the implementation of technology education in Valley View Secondary school. In addition, the qualitative paradigm allows me to contextualise the experiences by being located in one specific setting. Individuals were observed in their natural setting the school.

### **The Justification for a Case Study**

According to Merriam (1998), A case study is an empirical enquiry that investigates a contemporary phenomenon in this study the phenomenon is implementation of technology education, viewed as an innovation. It was conducted with depth and within a real life context as classroom observations were one source of data collection. The boundaries between the phenomenon and context are not clearly evident as the context may include many other variables which are not under investigation in this study.



The case study inquiry encompasses the logic of design, data collection techniques and specific approaches to data analysis. It is not just limited to a data collection strategy or a design feature alone but is an all encompassing approach.

As a researcher, one sought to uncover the interaction of significant factors of the implementation process. There are many variables being intrinsically woven into the school's context that they are inseparable, hence, the suitability of the study to a case study form of inquiry. "Case study is a design particularly suited to situations in which it is impossible to separate the phenomenon's variables" (Yin as cited in Merriam, 1998).

Merriam purports that "the focus of research in a case study is on one unit of analysis. There may be numerous events, participants, or phases of a process subsumed under the unit" (Merriam, 1988). In this study the case or unit of analysis is Valley View secondary schools, a government co-educational school which was de-shifted five years prior to the period of research. It is within this unit that a sample of teachers was selected.

## **Sample**

The study focused on a de-shifted government secondary school. It was established in 1975 as a Junior Secondary School. It was de-shifted thirty years later in September 2005. Initially, the curriculum included Mathematics, English Language, Social studies, Physical Education, Integrated science, Spanish, Music, Art & Craft Agricultural Science, Industrial arts (Woodwork, Technical drawing, metalwork) and Home economics. This curriculum has now expanded to include Dance, Theatre Arts, Principles of Business,

Biology, chemistry, physics, Information technology, History , Geography and Technology Education. The student population is 875 with a teaching staff of 65 of which 16 technical vocational and 12 are required to teach technology education.

This school was selected for a multiplicity of reasons; one being it provided ease of access as the researcher previously taught at the institution for a period of 8 years.

This school was selected because there are several teachers of varying background, disciplines, technological and educational experiences who were all required to teach the same subject. This would facilitate broad perspectives on their experiences with the implementation process. In 2009, the Ministry of Education sent a memorandum to all schools stating that there would only be Technology Education examinations at the end of Form 3 and the school wrote the NCSE examination in Tech Ed for the first time in 2010. The Technology education curriculum is considered an innovation.

Purposive sampling was utilised where individuals showing different educational background based on experience and professional teacher training as well as training in technology education will be selected. Teachers were selected based on length of service: less than five years teaching experience, 10-15 years experience and 20 or more years experience. They were selected because they were all tech education teachers who were former teachers from the three main disciplines, Home Economics, IA and agriculture. This was therefore a representative sample as Technology education programme advertised training for teachers in these 3 disciplines only. Technology Education teachers from the different subject areas were exposed to various types professional training, the entry level qualifications into teaching also varied. These teachers would have different experiences in terms of their training as well as with

implementing previous innovations. Therefore it was important to select at least one teacher from the Home economics department, the Industrial arts department as well as Agricultural science.

## **Participants**

To gain rich thick data a maximum variation strategy was used to select participants. Pseudonyms were used which was consistent with maintaining confidentiality and anonymity in the presentation of data.

### **Josiah**

A teacher of more than 15 years experience has received a technician's diploma and has a teacher training from John Donaldson technical institute. He also possesses a diploma in technology education from the Mount Saint Vincent University. He says he has a love and passion to teach technology education commensurate the approach taught during the one year diploma training.

### **Wendy**

She is young teacher who has a Technicians Diploma and a Bachelor of Science degree. She has been teaching for 3 years and was a participant in the 2 week vacation training programme in Technology education.

Marcia

Marcia possesses over 20 years teaching experience. Her qualifications include a technician's diploma as well as Bachelors of Education degree. Participation in the two week training programme in technology education is a part of this teacher's professional training.

### **Data Collecting Strategies**

The methods for data collection used in this study were one on one interviews, observations and document analysis.

Interviews are a valuable source of data collection for the development of this case study as these enabled deeper insights into participants' (teachers') ideas and understanding in a more in-depth manner which other methods may permit (Knobel & Lankshear, 1999). Semi- Structured interviews by their very nature were not limited to the prepared interview protocol (see Appendix II), but allowed for further probing of responses to develop deeper cognition of the participant's responses, this added enrichment to the data collated.

One advantage of using interviews in this study was that it afforded the opportunity of focusing directly on the case study topic, the experiences of teacher in the implementation of technology education. Interviews have also provided insightful information to the study.

Observations were utilised to capture the participants within the context of their natural setting. For this study there were classroom observations, to isolate pedagogical strategies that may be best practices. The researcher assumed observer status with limited

interaction with participants. The researcher was not too intrusive in the classroom setting. This involved systematic noting and recording of events, behaviours in the classroom context.

Observations were conducted in two phases. An initial observation was conducted to allow students and teachers to be comfortable with the presence of the observer. The second phase involved the use of an observation schedule. (see Appendix III).

Observations were particularly valuable because they facilitated examining events in real time; the researcher was able to obtain a firsthand view of activities in the natural setting. It allowed the researcher to understand the dynamics of the context and the case being studied.

Document analysis e.g. timetables, schemes of work, and students' portfolios and challenge sheets (see Appendix IV) were used a source of data collection. According to (Yin, 2009) documents are used to corroborate and augment evidence from other sources. There were attempts to determine any contradiction between the teacher's interview responses and documentary evidence e.g. Detecting and differences between comments with respect to timetabling and the actual time table. Inferences from the documents were used as clues of any aspects of the study worthy of investigating.

These allowed one to determine any strategies for coping with challenges as well as best practices which may have been missed in the other data collecting strategies.

Documents were a good source of data as it allowed one to review the information repeatedly. As the data was being collected, it was possible to begin analysis of the data, both of them occurring concurrently.

## **Data analysis**

This process of analysis is where the researcher attempted to make meaning out of the data by going through consolidation, reduction and interpretation of what participants stated, what was observed and read. The meaning and understanding or insights gained from this study have formed the basis of the research findings. In this study data analysis occurred when the researcher constructed categories or themes “that captured some recurring pattern that cuts across the preponderance of data” (Taylor & Bogdan as cited in Merriam 1998 p, 179).

These categories or theme were concepts indicated by the data and not the data itself (see Appendix V). The categories were devised systematically and were informed by the purpose of the study and the researcher’s orientation and knowledge as well as the explicit meanings of the participants (Merriam 1998 p.179).

The categories were constructed through the constant comparative method of data analysis. This method has been utilised by researchers who were not seeking to build grounded theory. This method involves using an inductive, concept building orientation central to all qualitative research.

Category construction began with reading the first interview several times. Notes were placed in the right margin next to the data that was most striking in relation to the research questions. After working through the entire transcript a fairly long list was obtained. The next set of data was scanned in the same manner. The lists received from both sources of data were compared and those items which reoccurred repeatedly or any patterns observed

were classified as categories. The categories were not the exact data but abstractions derived from the data (see Appendix VI). It was designed to cover a span of examples from this category.

The names of categories were derived from a combination of what was reflected in the data and based on the literature reviewed.

The categories were designed to reflect the purpose of my research and to answer specifically the research questions. Attempts were made to place all important data into a category. The categories were mutually exclusive. However in the case of Resources varying sub- categories were deemed necessary. All categories were congruent involving the same level of abstraction as much as was possible.

There were several categories derived five under facilitating factors and nine categories under inhibiting factors and nine categories under strategies.

Once the categories were named, the researcher reviewed the data thoroughly searching for more units of data and more pertinent information.

Overall this is the process I would employ in reducing the data to a small set of categories or themes that categorise the process or action being explored, which are the experiences of teachers during the implementation of technology education at Valley View Secondary school.

## **Ethical Considerations**

The issue of ethics in conducting this qualitative study is of great concern to the researcher. A letter was written to the principal requesting permission to conduct the study. (see Appendix I). Permission was granted before data collection began.

Participants were invited to participate in the study after being informed of the purpose of the study, their right to anonymity and confidentiality and that they were free to withdraw at any time.

Triangulation using multiple sources of data was utilised as observations with interviewing and document analysis were combined in this study as methods of data collection. This was done to gather data to answer several research questions and to use different methods or sources to corroborate each other as a form of methodical triangulation.

There was data verification as respondents were allowed to review the findings to ensure that there was agreement. Prior to this the participants were also given access to the transcribed interview to ensure no misrepresentation occurred.

There was always a possibility of researcher bias as the process of data collection and analysis was conducted,

As is customary the supervisor reviewed the researcher paper and provided clarification during the period of the research.

Pseudonyms have been used for the school as well as for participants to ensure anonymity of participants.



## **Trustworthiness of the research**

The credibility of this study was established as it was confined to one school, one discipline i.e. technology education and a theoretical framework associated with the implementation process associated with an innovation. It is couched against the backdrop of the Concerns Based Adoption Model's stages of concern and levels of use.

The findings of this research cannot be generalized outside of the stipulated parameters of this context.

All data is well organised and retrievable, to provide an audibility trail. Data was preserved and is available for re-analysis.

The validity is the truth, interpreted as the extent to which an account accurately represents the social phenomenon to which it refers (Hammersley, 1990 p. 57). To address this issue and possible anecdotalism, the approach of triangulation and respondent validation were utilised. The preliminary findings were reviewed by participants and were refined as the need arose. The use of the constant comparative method of analysis according to Glaser and Strauss as cited in Silverman (2002 p. 179) simply involves inspecting and comparing all the data fragments that arise in a single case. This approach is not limited to the comparisons between of different cases

Reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions. This was addressed by documentation of my procedure and the consistent use of categories in data analysis.

## **Delimitations**

The case study was delimited as the data was collected from a small sample of three teachers in one secondary school. The findings are limited in transferability beyond this setting and would not be applicable to a larger context.

## **Limitations**

There were limitations associated with the interviewing process. Accuracy was dependant on the teachers' ability to recall, they may have excluded information deemed unnecessary, unpleasant or that may just be forgotten. Additionally, there also may be response bias as respondents are former co-workers and colleagues in Tech Ed. There also may be some measure of reflexivity; in that the interviewee may give responses that they perceive may be of interest to the researcher. There may have been some small measure of reflexivity as events may have proceeded differently because it was being observed.

There was limited time to conduct observations since the term was extremely short CSEC examinations beginning the first week of the term and NCSE examinations beginning only 5 weeks into the new school term. The observation process was very time consuming.

## **Chapter 4- Data Collection and Presentation of Findings**

This study examined teachers' experiences as they implemented technology education at one secondary school in Trinidad. This chapter will inform the reader on the data collected as well as the findings obtained. As part of the ethical considerations pseudonyms have been assigned to all participants and to the school as well. In this research the data was analysed and categories formed to answer the research questions.

### **Research question one**

What are the facilitating factors experienced by teachers, in the implementation of technology education at this school?

### **Ministry of Education Personnel Support**

The input of curriculum officers was a marked contribution noted by all participants.

Maria commented, "Intervention of the curriculum officer she came about twice to ensure we were headed on the right track. That was great help".

To the question, "What support structures has the ministry introduced to assist you in teaching Tech Ed at this school?"

Peter responded:

They did come to us a couple times where they spoke to all the teachers involved and spoke to us about what technology education is all about and how we should go about implementing it in the school that was about 2 years ago.

He later added:

Our main problem in the beginning was the conflict between teaching how we were trained and just using the approach that was the big issue as far back as I could remember. The curriculum officers came several times to clear that up.

These comments showed clearly curriculum officers as representatives of the Ministry of Education, facilitated the process through repeated visits.

### **Training and Professional Development**

All participants thought the training they received, though different, was adequate for the teaching of the subject.

Peter commented:

I enjoyed going to the training I think that what I was trained to do if I had an opportunity to implement that that would have been sufficient. Some more could have been added to it may be some follow up. But I think that was enough to implement.

Wendy remarked:

I think yes if you are trained in the subject areas , then it's just to use technology education how it will apply so two weeks would be sufficient two weeks is sufficient. I was thinking about communication some teacher don't know how to use it is just a style of teaching.

Maria was also of the same opinion:

I was very impressed in the training but right now if I could go to a little in-service training would be fine. I would like to do a refresher course but every time I ask if I could go and do it over now that I have gone out into the field and do. Now that I have seen the

hiccups, I don't mind going back and sitting in. But the last person I spoke to said no. So I know that it's a no, no, but some in-service training, I could do with that.

### **Colleague Support Across Subject Areas**

The technology education teachers were able to cooperate with other teachers on the compound to use the available skills and expertise to enhance the delivery of the school curriculum.

Maria said:

I realised some teachers are very good with the camera, so I made an appointment with her. So could you come and teach us how to use the camera effectively? On Friday coming we have one of those sessions, she is a science teacher. She has nothing to do with technology 'per say'. She is coming to do a lesson with us all. There are other areas too with respect to communication. Spoke to the music teacher. Learn how to do a little jingle and basic things about designing a skit. In that way we include other disciplines in technology education. In that way it benefits the school that way it benefits the school.

### **The use of General School Resources**

These resources were not directly assigned to the Technology department. When asked the question "What measures have the administration at this school instituted to ensure successful implementation?"

Maria said:

Nevertheless they listen to us, from this year, the library and the IT lab, the teachers were told that we (*technology education teachers*) should be allowed use it when not used by the form 4s and 5s.

## **Changing Attitudes with Improved Communication**

Maria mentioned that open communication assisted with implementation.

She said:

There is a particular administrator I was able to sit down and explain and now is a little more yielding that's why we got the computers we got those computers in September - October .We got that because of sitting down and explaining to the administrator and getting an understanding of what we are doing and why it is important explaining what we were doing and why it is important. A requisition for six computers was made. And we created a room up in home ec and created a technology education lab up in home ec so that was a plus for administration.

## **Research question two**

What are the barriers or inhibiting factors experienced by teachers in implementing technology education in this school?

Some barriers to implementation emanated from teachers concerns which have not been resolved. The CBAM model highlights stages of concern which provides a way of viewing people's feelings and perceptions as they evolve over time. Some categories emanating from the data speak directly to various stages of concern. Subject content knowledge can be viewed as a task related concern as teachers are concerned with the management of the innovation with particular attention on the processes and tasks of using the innovation and the best use of the information or content communicated.

## **Subject Content knowledge**

**To the question “How has technology education been implemented in your school?”**

All teachers lamented that there was conflict in what to teach in technology education.

Peter said:

Our main problem in the beginning was the conflict between teaching how we were trained and just using the approach that was the big issue as far back as I could remember. The curriculum officers came several times to clear that up. They were saying we were doing one thing and they wanted us to do something else. I remember clearly, we weren't supposed to leave our content area and teach the approach.

Maria remarked that:

There was an old way in which it was taught and now there seem to be some modification some people taught they were there in the beginning of it and that is it. They were not willing to modify.

Wendy added:

We had 2 problems we had those who had done the technology education diploma or degree and they had a different idea as to what the new technology education was all about. So that alone was confusing because was just 2 of us teachers went to do the new system and when we said it was supposed to be like ABC, no that is not what it is supposed to be and they were going through the book and showing us and we were saying no it change, what they thought it supposed to be from the past it was not that so they had a lot of people grumbling and quarrelling that is not what it was supposed to be and how these teacher who went on the two week program come and get a certificate.

## **Professional Attitude and Values**

In the earlier stages of the introduction of this innovation it is evident that personal concerns were expressed as teachers were interested in their ability to teach the subject before they were trained. One teacher focused on the disappointment of not being able to teach the content exposed to during his training. Teachers' attitudes severely impacted the implementation of this subject at this institution.

To the question, "What are your feelings about the way in which Tech Ed was implemented especially in its initial stages?"

Wendy responded:

You see I was not really there the first time the students were telling me they used to do some type of Tech Ed before and then the school scrap it and then we had to re implement it that is when I went to the training and it(*Tech Ed implementation*) was not done the right way and we had a lot of teachers who did not appreciate technology education. I may have been one of those until I went to the training course. It was not done right there was a lot of uneasiness.

Peter mentioned:

I was a bit disappointed in that what I was trained to do I was not supposed to do. Because of the training I got and not being able to do that and not using the content area from that was a bit disappointing.

This was in response to the question

"How have your experiences in this entire process impacted your delivery of the curriculum in the classroom?"

Maria shared her initial attitude and approach to the implementation:



Some teachers were sent to do technology education and when we came out to school we heard that tech ed was on the curriculum, It didn't bother me much because it was only the technology education teachers who were trained who had the diploma were trying something with some students and then suddenly we realised that we were not doing technology education again. We were reverting to what we used to teach before it was a selected few who had done the program it was foreign to me and at that point in time I didn't understand the purpose of it from the time you hear technology you think is computer, that's all you think of I know I was illiterate where that is concerned and it was only for the select few. It was left alone.

However, after her training Maria got onboard and spoke of her experiences with the other Technology Education teachers.

It is interesting to note that since "change is a process not an event" that this participant move from being preoccupied with self or personal concerns to those of impact namely being concerned with more collaboration among teachers.

Maria shared:

After the training ...and having come back to the school that's when we got the bang if I may call it so because people still want to teach their subject because the mind set was that they want to throw out tech voc and when they pull in Information Technology they felt they wanted to throw out Information Technology as a subject. So everybody still holding on they don't want to let go and when you came you shared with them they didn't want to hear you, they held on to it. Even up to now if you go to classes teacher are not using the concept of technology Education.

## **Resources**

The procurement and availability of different types of resources were mentioned repeatedly by all participants as being an inhibiting factor. Any difficulty related to resources is couched in the backdrop of task related concerns.

### **A technology education laboratory.**

Maria said:

We have resources in terms of bowls and blender and what have you. We are still looking for a place where they can be distributed in such a manner where they can be used, so we can make good use of it . The labs we don't have any place to put the labs, mobile labs.

Peter complained:

We started implementing it and we didn't have a lab we started going to the classes because we didn't have a lab.

Wendy commented:

Space is a problem, we don't have the space..." and also that "it was not fair to the students we are not fully prepared, we don't have the facilities. The laptop is a big issue. We have a make shift technology education lab, 6 computers, no printers no internet, we still working on it we cannot do much. We don't have a storage room to put the Tech Ed. materials, all of them in one place, to me we are not fully there we are getting there but we not there yet.

Also noted in the school environment were large mobile labs fully loaded, but what was lacking were the computers and other Information Communication Technology (ICT) equipment as well as internet access.

**Funding of Technology Education.** Teachers also expressed concern about available financial resources.

Wendy stated:

We need access to the resources one of the major problems, I have put in requisitions a lot, I have my copies. A quarter of it I get, so it doesn't make sense doing up the requisition. I'm wasting my time.

Another participant responded:

When you go to the office there are no funds although there is supposed to be an allocation but they keep mixing up the form 4 home ec and clothing and textiles with tech ed they bundle all together and when you for funding. You see the ink for the computer they cannot understand why we need so much ink for the computer you can tell them the children typing up their portfolios that children are printing pictures they don't understand so for the term they want to give you two cartridge of ink sometimes you just go and buy it. You just go and buy it.

Peter on the other hand used resources traditionally assigned to his department

We were basically using the Tech Ed. approach in our content area whatever resources we normally would ask for that content area. We didn't have to source anything. The resources that we have in the labs, the labs didn't really have anything.

**A lack of library services.**

Two of the three participants lamented:

We don't have a library –in terms of problem solving especially for biological science where we could get information not agric science, not biological science. I have made orders. They only have the textbook not enough books 2/ 3 books for tech ed. that is not

enough for a whole school certain things are lacking. We should have our own tech ed. library, *with* books that have problem solving skills for the students.

Maria spoke of a search for books:

The next thing I sourced was a book which was a little difficult .Available print material on general areas of technology education appeared almost nonexistent for teachers at this school.

### **Information, Communication Technology equipment.**

Maria stated:

The computers and the printers and cameras these were things that I had to outsource.” She continued that, “right now the children stealing internet. ( I shouldn’t put this there). There is someone from the village has internet and the students realise they have internet to their disposal. They go to the side of the school and if you call that out sourcing that too is out sourcing”. It eventually got better as “A requisition for six computers was made. And we created a room up in Home Economics and created a technology education lab up in Home Economics so that was a plus for administration.

Wendy retorted:

Again I had to bring my own two laptops a. I had a computer and I had to transport it from one place to the next. I had a computer a laptop and the school 2 other laptops I had the students in that room to get the work done it was a lot of work. I had to go and bring research material. Because people didn’t have computers so it was strain.

When Peter was asked how has the administration (Principal, V. Principal, Clerk3) demonstrated their support? He replied “The resources maybe to get a lab fully equip to do tech Ed would have made the difference.

### **Timetabling**

Issues relating to efficiency organising, managing and scheduling are task concerns according to CBAM’s model. The need to create an effective and fully functional timetable was voiced by all participants.

Maria said:

Eventually something was done with the time table to accommodate I must say the accommodation is one that we appreciate. However it is far from the ideal.

Later in the interview Maria stated:

If we work together as a team we sit down together what should we do we should have one scheme of work, one because in every given week you move from me and you go to the other person because that is how our timetable is suffer it to be so. It is not like in some schools where they have the timetable and teachers come together. It is not happening like that, we have already been told that it is not happening like that but we can still let it work.

Wendy added:

We don’t have the time table to teach technology education, as yet, we are putting something in place but we are not there as yet the form 1 form 2 they have not grasp the practical exam part.

Peter said:

We had to split up , because we had Industrial arts , Home Economics, Agricultural Science and IT involved we had to come up with a formula as to how we would split up the classes and who was going to teach which component. We have a roster of who will be producing portfolio, when because too many portfolios for the children to be doing one in each area. They have the system we have here there are the different areas for each term.

Perusal of timetables demonstrated that some teachers had three periods at a time and others only double periods not allowing adequate time for the completion of products and exam preparation. At some times a teacher taught one class for one term and a different class in the same year group for two terms.

### **Poor infrastructure**

It was observed that the setting includes poor lighting the class was located close to the door and around the two lights that were working. There was limited furniture. There was also limited space as most of the labs were used for storage.

The CBAM model includes a stage which considers the participants concern about the impact of the innovation. Impact concerns focus on the impact the innovation had on the clients as well as to focus on collaboration and cooperation with others regarding the use of the innovation. Others in this context included the administration, parents and other teachers. These concerns when they are not addressed in a timely manner act as inhibiting factors to implementation.

## **Parental Involvement and Attitudes**

The need to have appropriate parental involvement was mentioned by two of the participants. Wendy was emphatically stated:

The parents need to be more informed at this school because the students have to print out the materials at their own cost and the parents have a big problem with that especially if you come from a poor background.

Maria also agreed stating:

If we look at parents as external factors we can see ignorance. Ignorance where parents don't really understand what the program is. When the children have to come and bring this material. They don't have an exam. You don't have an exam and worst yet the teamwork. All the parents were coming, saying my child doing all the work. Everybody thinks his or her child is doing all the work for the group and it is unfair and the parents come here and argue that. It is unfair that my child is working hard and the other children are not working and they are getting the same marks when we talk about teamwork so ignorance on the part of the parent is a problem. Because they manifest negative behaviour that the child comes in school with, y mother says that I have to do all the work and that shouldn't be and they got... and that causes conflict sometimes.

## **Inadequate Support and Level of Understanding by Administration**

Maria was of the view that "Even though requests were made for certain things so that the program could go on there was a little resistance by the administration. I think it wasn't properly sold, administration themselves are not fully aware what it is they may say the learning outcome but the true essence of technology education I don't think they

have grasped. So that is a problem. There is a particular administrator I was able to sit down and explain and now is a little more yielding that why we got the computers we got those computers in September October -we got that because of sitting down and explaining to the administrator and getting an understanding of what we are doing and why it is important explaining what we are doing and why it is important”.

Wendy commented:

Initially it was not supported by administration, tech ed. because it was forced on us. We had no other choice we had the curriculum officer come into the school it and had to demand that it had to be done and it had to be done it is not really accepted by administration. May be they need to target the administration and let them know the importance of it and train them in it so they can see.

### **Communication during Implementation**

When asked about the approach utilised in implementation by the curriculum writers Peter reported that it was an instruction from the ministry of education, “We were mandated to do so and they said everyone supposed to.”

Wendy thought it was compulsory, “It was forced, there was no choice, we have to do it, it was not like this is great... Let’s do it. No it was forced.”

Maria reported:

Suddenly coming around to exam time we got a circular telling us they will no longer be doing home Economics , ie what you have to do and the exam that needs to be done is technology education well that was what.. We didn’t even have technology education class far more exam. A few of us sat in a workshop, no, what was it ...a discussion because we were not getting home Economics .It was and the principal at that time said



go ahead we got the exam paper and someone came from the ministry to explain what was to be done you hear crash that was a real crash (*programme*) because it crashed.

### **Collaboration and Collegial Support**

The need for collaboration was a view expressed by Wendy and Maria, “If you don’t have the collaboration of teachers and administration coupled with resources and space it is very difficult to teach technology education in the right way for children.”

Maria added:

There is no cohesion. I personally think, and that is what is lacking, that the teachers of technology education should sit down together. But if we work together as a team, we sit down together what should we do we should have one scheme of work.

### **Research Question 3**

Although teachers demonstrated intense task concerns, the concern for students influenced teachers’ decision making and led to the development of teaching strategies to cope with the change.

How have teachers’ experiences with the implementation of Technology Education affected their pedagogical strategies in the classroom?

Many pedagogical strategies were identified during the interview process as well as being evident through the observation process.

### **Integration Across the Curriculum.**

This is a strategy used that adds deeper meaning of the curriculum to those students, and that was specially developed to cope with this innovation. Maria mentioned.

“But having to teach tech Ed to the children I recognised that I had to empower myself”

She continued:

There are other areas too with respect to communication. Spoke to the music teacher.

Learn how to do a little jingle and basic things about designing a skit. In that way we

include other disciplines in technology education. In that way it benefits the school that

way it benefits the school.

### **Maximising Existing Space for Better Use.**

The concept of a versatile classroom was developed just for the particular activity and was to address the lack of an exiting lab.

Maria said:

A novel ideas was a the organisation of a lab, “ It was a classroom in use that was converted to a lab for that particular activity because afterwards it change back into a classroom I thought that was really very impressive.”

### **Starting at Different Stages in the Design Process**

Peter said, “To get the children’s interest we need to stay away from the written part for a while and get them into doing a lot of practise. If you start them off with the portfolio it is really difficult to get to it. Start off by doing some practical and then introduce the portfolio then that works with the type of children we have.”

### **Incentives or Motivators**

Maria said that:

Some think it's too stressful because it's new to the students as well so that we will not be getting the full participation of the students that in itself is a challenge.

Wendy however used motivators continuously, "Throughout the term I give them bonus marks, for simple things" During observations it was noted that encouragement, commendation, and taking home the finished product, to be seen by family members were also used as incentives. She also listed motivators as a best practice.

### **Organisation and Planning**

A teacher who is organised and well prepared for delivery was one approach considered to be beneficial. As teachers struggle to understand alternative and authentic assessment, an organised system aided while the innovation was being introduced. A thorough assessment and evaluation system with an effective recording system was observed which was of great value.

Best practices for this innovation technology education were listed by Wendy included, "Planning as much possible and proper record keeping let them (*students*) know you are marking for everything"

For other teachers, evaluation sheets in tabular form were designed for ease of assessment. This demonstrated a high level of organisation as it allowed for ease of marking.

### **Alternative Assessment of Students**

Maria engaged students in various forms approaches to assessments.

Maria commented:

The student who is not really academically inclined when you put them into the groups you get to see exactly what the child can do outside their academic area. And these

students feel so important when they are in their groups and they are making a contribution that is recognised, as a teacher it enriches you, besides having to improve myself in different areas.

Peter vowed to “stay with the initial style, Place them in groups for the problem solving method”.

To the question, “What are some best practices you may want to share with new teachers?”

Wendy replied “work in small groups, class (*should be*) divided not large number.”

## **Discussion**

Guided discussions were a teaching strategy used by teachers, as students asked what to do with the paper, what to do with Bristol board and what to do next? This was necessary as the entire problem solving approach was new to these form one students.

## **Comfortable environment**

Discussions were facilitated by a comfortable environment, created by the teacher, who was observed as demonstrating the role of facilitator. Students felt comfortable to engage each other in dialogue as well as to make mistakes and to scrap the design and do it over again. These were noted during observation sessions.

In this study, it is therefore apparent that there were a few facilitating factors to implementation with an overwhelming majority of inhibiting factors which placed teaching in a mode of emergent problem solving which was the right environment to develop , enhance and generate new strategies for enactment in the classroom.

## **Chapter 5- Interpretation, Discussion and Recommendations**

It is an undeniable fact that technological advances have impacted the lives of human beings in a profound manner. Therefore it is imperative that the education system of Trinidad and Tobago prepares students for the impact that technology is going to have on their social and economic future. In T & T the overall goal of technological literacy, critical thinking and problem solving are central to technology Education

However based on the discussions at workshops and NCSE standardisation meetings, as well as informal discussions with curriculum officers, and the evidence that many students are not writing the NCSE examinations in this subject, it appears that teachers are hesitant to implement Technology Education.

This qualitative case study was conducted to gain insight into the experiences of three teachers, enquiry into these experiences focused on the barriers and facilitating factors experienced in the implementation of Technology Education in one secondary school in Trinidad. Additionally, in this study I attempted to unearth strategies utilised in overcoming challenges experienced during the implementation process.

The overarching research question which directed the study was;

What are teachers' experiences of the implementation of Technology Education at Valley View Secondary school in the St. George east district in Trinidad? The sub questions which focused the study were as follows:

1. What factors, experienced by teachers, facilitated the implementation of technology education in this school?

2. What factors, experienced by teachers, inhibited the implementation of technology education in this school?
3. How have teachers' experiences with the implementation of Technology Education informed their pedagogical strategies in the classroom?

Based on the data collected the findings could be summarised accordingly.

It was noted that support for implementation was provided by the change agents, these being curriculum officers. They had one purpose, which was to ensure that teachers were embracing technology education and its multifaceted approach.

The input of curriculum officers was a marked contribution noted by all participants. This was captured in Maria's statements "Intervention of the curriculum officer she came about twice to ensure we were headed on the right track. That was great help". The curriculum officers for technology education at that time, performed an important role "a change agent is an individual who influences client's innovation- decisions in a direction deemed desirable by change agency. A change agent usually seeks to secure the adoption of new ideas, (Rogers, 2003 p. 366). Hall and Hord, (2006) identified the change agent an "external innovation expert who engages with the client system to introduce and encourage adoption of the innovation."

The Ministry of Education facilitated the adoption of the innovation through available change agents as well as through appropriate training and professional development. The ministry of education provided two basic types of training one was a Diploma from Mount St. Vincent University which lasted one year. The second was an introductory, 2 week course. It was interesting to realise that regardless of the training all participants felt it was adequate to equip them to teach the subject. All however would have appreciated a follow-up or refresher program.

Participants reiterated that having completed the training programme before teaching the subject, further training would be valued as they have experienced certain difficulties in the field. The information would be valuable the second time as it would be viewed in a more realistic and practical context based on experience.

In some areas around the world, e.g. Queensland, Australia “professional development and support were also identified as challenges with the study” (Finger & Houguet, 2009) and in Mauritius “the training of technology teachers and the limited exposure to new technology and to a wide range of processes remain real challenges for proponents of technology education in Mauritius.” (Williams, J. 1996, p. 282). The literature show this be a serious challenge in some third world countries, however in this school the training appeared to be beneficial initially was considered to be a facilitating factor, though the data showed that it was not completely adequate because teacher wanted a refresher course.

For the second research question, this states;

**What are the barriers or inhibiting factors experienced by teachers in implementing technology education in this school?**

The issue causing greatest concern was the knowledge of what technology education entails and how it should be taught. The subject content knowledge was a major problem because teachers at this school were trained differently with a different curricular content. So initially the question was who was right and who was not?

All teachers lamented that there was conflict with respect to the content to be taught in technology education.

Participants were emphatic in the conflict which arose from the two different types of subject content offered by the diploma in Technology Ed. and the two week training program. A major factor was not in the account of this incident but that teachers were taught two diversely opposite approaches to tech Ed subject content.

The literature implies that the curricular content of technology education may change very quickly. Williams (1996) wrote “There is certainly a stated awareness that current technology is more dynamic than in the past, and so changes in what is considered appropriate content and best practice in technology education could be expected to change rapidly.” However in Valley View Secondary School the overall frame work was switched from a program with a specified content to one that was just the problem solving approach that could be applied to any subject area. The literature speaks of the differences between countries being “more in the implementation process rather than in basic philosophies about what constitutes technology education.” Williams (1996). This was at variance to what actually took place in the school being studied.

The overall attitude of teachers impacted heavily on the implementation process. Teachers’ professional attitudes and values severely impacted the implementation of this subject at this institution. There were those few who were eager, those for whom it didn’t matter and those who were radically opposed. This resulted in a first attempt at implementation and then a reimplementation a couple years later. Many teachers felt annoyed at the prospect of being forced to teach technology education. All teachers’ concerns about the innovation which were not addressed resulted in Task concerns, Impact concerns not being addressed and subsequently acted as intrinsic barriers to implementation (Hall and Hord, 2006 p.139).



Another area of concern mentioned by teachers was the lack of available resources. The lack of an assigned room or lab fully equipped with tools and equipment was an issue mentioned by all participants.

Hamilton and Middleton (2001) found that appropriate facilities and equipment, support from school's administration and an adequate budget enhanced the implementation of Technology education in Australia. The results of this study showed many similarities except that the resources were available but were not readily accessible. For the ICT equipment money was available yet it was not channelled in this subject area. The lack of resources also included books and any other print material and overall poor library services

Perusal of timetables demonstrated that the numbers of periods for the Technology Education varied. One teacher may have two form one classes, one with two periods and the other with three periods at a time ( see appendix IV)Some teachers had three periods at a time and others only double periods not allowing adequate time for the completion of products and exam preparation. Gibson (2007) stated "Teachers suggested that the time allocated to this new subject created challenges and the two specific issues which were highlighted were the allocation of curriculum time for pupils within the subject and the allocation of preparation time for teachers. Teachers argued that more time was necessary to ensure that the demands of the programme of study could be met.

Poor infrastructure was evident at this school. It was observed that there was poor lighting in one of the classrooms. Students and the teacher arranged themselves around the door and two working lights. The (mobile) labs we don't have any place to put the labs, mobile labs. Through observations it was clarified that a lot of resources may be stored but not accessible and ready for use. It was noted in the school environment there were large mobile labs fully loaded

but missing were the computers and other ICT equipment as well as internet access. So a valuable clarification is that tools and equipment in the specific content areas were available which were stored and took up a lot of space. Access to these was also very difficult.

According to Mitchley as cited in Ncube (2008) there are three types of laboratories for technology education. “three types of technology teaching and learning rooms and he bases his classification on the size, equipment and the layout. He classifies them as being the classroom type, the technology room and the technology centre.”

In this school an intermediary stage, between the classroom type and the technology room is the type of facility evident. This is a classroom with limited tools, yet even the basic requirement of proper lighting was not available at one Technology Education area. “It consists of adequate lighting, few tools, can be a mobile workshop that has shared tools that are moved from one room to another.” The second category of lab is “A technology room according to Mitchley (2005) has adequate lighting and space, flat table work areas, access to water and electricity tool and material storage areas, space for designing, planning and construction. The room also has got to have safety features, first aid kit and waste disposal areas”. However based on the interviews teachers are interested in a technology centre as this category includes computers, design area, the drawing area, large tables, machine area, and storage room, display room overhead projector and it is a multipurpose workroom.

The availability of funds appeared to vary between the former departmental demarcations. Teachers also expressed concern about available financial resources. All subjects apparently did not get similar amounts of money, within the technology education department some individual subject area appeared to be getting more funding than others. This accounted for the disparity in reports from participants since they all came from different subject areas.

However, all agreed that there was a lack of computers and associated, information, communication and technology equipment. Based on observations two out of the three work area, classroom had no computer and one area and six working computers with no printers

The need to create an effective and fully functional timetable was voiced by all participants.

A lack of parental support and poor attitudes, due to a lack of knowledge and understanding, was a barrier to successful implementation. Some parents were concerned about the financial commitment to provide resources on a repeated basis. Others were concerned about the lack of fairness in the assessment process especially since it was a group project. The lack of a written paper and pencil test was also a problem. The need to have appropriate parental involvement was mentioned by two of the participants

Gibson 2009, conducted research in Northern Ireland, He stated “Parental perceptions of subjects tend to be influenced by such issues as their ability to help children with homework and coursework. According to the teachers, parents find it difficult to provide as much help with Technology and design as they do in other subject areas.” However in this context parents were concerned about the added cost for this subject as compared with the traditional subjects with which they were familiar.

Inadequate support and level of understanding by administration was a challenge expressed by teachers. The support of the administrative leaders in any school is crucial they appeared to be reluctant initially. However administration provided small amounts of assistance as a result of dialogue and their improved understanding of the subject.

Communication between curriculum writers and implementers caused some concern among teachers. When asked about the approach utilised in implementation by the curriculum writers . Teachers thought it was very dictatorial and forced.

The need for collaboration among teachers to produce a synchronised coherent programme was a view expressed by participants. Collaboration with administration about the purpose and needs of the programme were also expressed.

### Research Question 3

#### **How have teachers' experiences with the implementation of Technology Education affected their pedagogical strategies in the classroom?**

Many strategies were evident as teacher were engaged unofficially in emergent problem solving as situation developed participants sought to solve the problems with a plethora of strategies. These were observed or revealed through the interview process on during the observation sessions.

A more efficient use of available space was a novel idea. Teachers used their problem solving ability and creativity to use the classroom to house a temporary lab and listed this as a best practise of Technology Education implementation. This was an effective way of creating an environment for collaborative learning. It facilitated group work as well as providing enough space for manipulation of tools and equipment. This enabled improved safety practices safety practices. Williams and Taylor (1996) stated:

If the facility is to provide the teaching area for a vocationally oriented program then it may emulate the world of industry, and take on the general appearance and organisation

of a factory. This arrangement may also be appropriate for a technology facility if there is a high degree of flexibility designed into their structures and layouts.

Though the literature does not speak directly to classroom modifications, it spoke of a need to apply the highest level of flexibility in the allocation and layout of laboratory space.

Starting at different points in the design process is a teaching strategy outlined by participants. This is comparative to the literature Mc Cormick (1996) spoke of supporting the design process by “starting the design and make activities from different points e.g. start with the intended solution and see if it fits the problem or starting with an existing product to see how it could be redesigned.” This is one approach to breaking the monotony of structuring the process around a set of steps. Having students start with production and then modifications is one approach to problem solving.

Incentives or motivators were beneficial and had a positive effect as it addressed some students were cautious of the new subject area.

An effective Technology Education teacher is highly motivated and tends to use a variety of measures to motivate students. The use of bonus marks and special privileges were some strategies. During observations it was noted that encouragement, commendation, and taking home the finished product to be seen by family members were also used as incentives

Increased organisation and planning

A teacher who is organised well prepared for delivery was one approach considered to be beneficial. Also observed was the thorough assessment and evaluation system with effective recording system which was of great value. This is also supported Williams, 1996

Best practice listed by Wendy included: Planning as much possible and proper record keeping let them know you are marking for every.

For other teachers and evaluation sheets in tabular were designed for ease of assessment. This demonstrated a high level of organisation as it allowed for ease of marking.

Authentic assessment and alternative assessment was a strategy used as teachers mirrored real life situations and developed challenges the students were able to identify with. Maria expressed with excitement “. Sometimes you help them create the challenge... you pull from them and there you create a challenge and from then and there you get a challenge and you get ways and means of solving that problem . It helps them to be critical thinkers .It helps them to deal with life’s problems”.

Guided discussion was a teaching strategy used by teachers, as students asked what to do with the paper, what to do with Bristol board and what to do next? The literature spoke of discussion as a strategy, not done haphazardly but deliberately structured and controlled by the teacher. Students are sometimes asked to discuss without guidelines as to what could be covered this may result in unproductive discussion. This could be prevented by greater guidance. This was particularly relevant as teacher coped with the new content and approach for their students.

Students felt comfortable to engage each other in dialogue as well as to make mistakes and to scrap the design and do it over again. These were noted during observation sessions.

### **Recommendations**

In conclusion there are a few recommendations for the implementation of Technology Education at this school. As Hall and Hord (2001) stated “There will be no changes in outcomes until new practices are implemented.”

Firstly, all teachers should be encouraged to attend the two week training sessions in the vacation. Given the dynamic nature of Tech. Ed, professional development sessions should be held for teachers biannually as a refresher for those trained a long time ago. Administrators should attend a one day sensitization workshop specifically on the purpose and direction of technology education.

Parents' days could include a session where parents are able to participate in a simple example of the design process so that they will understand the purpose of technology education along with the goals.

One would also recommend that the time table be revisited to facilitate the four periods a week. Teachers should collaborate viewing the entire three year period as a block to cover the content of the curriculum.

Administration should make slight alternations to the mobile unit so that they could be placed in the respective rooms so allowing for easier access.

A complete revamping of the ICT department with internet access and more computers in the already assigned room is needed. Computers should be added on a phased basis probably 10 a year. Printer ink should be budgeted for out of the annual financial allocation given to the school.

There is a need for greater collaboration among all twelve teachers so that there would be continuity and little duplication and monotony in the delivery of the curriculum.

### **Conclusion**

Teachers experiences at Valley View Secondary school have indicated that they are a few factors that facilitated its implementation essential the training the support from

curriculum officers during the process. However their experiences are marred by many inhibiting factors which prevented them from implementing fully up to 1 year ago. They have been forced to do it. They have struggled with what exactly is the content for this subject. They struggle with stakeholders not really catching the vision. They have developed strategies or best practices to enable them to successfully surmount many of their obstacles.



Appendix I - Request for permission to conduct the study

Brazil secondary School  
Brazil Arena Road,  
Brazil Village  
10<sup>th</sup> May, 2011

Principal  
Valley view Secondary  
Valley Crescent  
Vermont

Dear Madam,

I am currently pursuing the M. Ed programme at the University of the West Indies. To this end I am seeking to complete the Project Report. To satisfy the requirements of this course, I am required to conduct research into a matter of concern and write a report.

I have selected an area of great interest to me, and other stakeholders in the field “**Teachers’ experiences of the implementation of the technology education curriculum ...**” I have been drastically affected by the implementation of Technology and have experienced a change of school, having taught at this institution for 9 years. I also experienced a change in subject taught .The change was all but easy.

It is my desire to look at the experiences of other teachers, some of their successes, challenges and coping strategies in the hope that all interested stakeholders may benefit as the implementation process is not over yet and certainly there may be implications for new innovations, which the ministry may introduce in the future.

I am therefore seeking permission and assistance in the data collection process. Your support will be greatly appreciated.

Thanking you in advance for your assistance.

Respectfully,

---

Eleanor Davis

## **Appendix: II - INTERVIEW PROTOCOL**

### **Over arching question:**

What are teachers' experiences of the implementation of Technology Education at one Secondary School in the St. George East District in Trinidad?

### **Sub- questions**

#### **1. What are the facilitating factors identified by teachers, in implementing Technology Education in this school?**

1. What is Technology education?
2. Do you register students every year for the NCSE examination? When was the first time you registered students for the NCSE exam and what prompted you to do it?
3. What has the introduction of Tech Ed. added to the value of the secondary school curriculum?
4. How has technology education been implemented in your school?
5. What support structures have the ministry introduced to assist you in teaching Tech Ed at this school?
6. What measures have the administration at this school instituted to ensure successful implementation?
7. What are your feelings about the way in which Tech Ed was implemented especially in its initial stages?
8. What support is evident from other Tech Ed. teachers during this implementation phase?
9. What have you sourced to enable you and/or your colleagues to implement Tech Ed at this school?
10. What personality and leadership style , should a Tech Ed. teacher should possess which will assist him/ her in the implementation of Tech Ed.
11. What are some other factors, (not mentioned as yet)which may have facilitated the implementation of Tech Ed.?

#### **2. What are the barriers or inhibiting factors identified by teachers in implementing Technology Education in this school?**

12. What are some of the difficulties faced with the implementation of Tech Ed at this school?
13. How has the administration (Principal, V. Principal, Clerk3) demonstrated their support?
14. What external factors impeded the process of implementation?
15. Were you adequately trained to teach this new innovation, Tech Ed? Describe your training and how you felt after its completion?

16. What are some other factors, (not mentioned as yet) which may have inhibited the implementation of Tech Ed.?

**3. How have teachers' experiences with the implementation of Technology Education affected their pedagogical strategies in the classroom?**

17. How have your experiences in this entire process impacted your delivery of the curriculum in the classroom?

18. How has the change from the old to the revised curriculum guide impacted your teaching of this subject?

19. What have you learnt from your experiences, both good and bad that enabled you to cope with the situation?

20. What new and creative ways have you utilised to ensure student performance?

21. What are some best practices you may want to share with new teachers?

Appendix III  
Observation Schedule

Topic: \_\_\_\_\_

Teacher: \_\_\_\_\_

Period: \_\_\_\_\_

Duration of the lesson: \_\_\_\_\_

Time	Stages in project based learning	Examples of content	Comments
	<p>1. The teacher <b>sets the stage for students with real-life samples</b> of the projects they will be doing.</p> <p>(Context)</p>		
	<p>2. Students <b>take on the role of project designers</b>, possibly establishing a forum for display or competition.</p> <p>(Challenge)</p>		
	<p>3. Students <b>discuss and accumulate the background information</b> needed for their</p>		

	<p>designs.</p> <p>(Research)</p>		
	<p>4. The teacher-coach and students <b>negotiate the criteria for evaluating the projects.</b></p> <p>Safety, teamwork etc</p>		
	<p>5. Students <b>accumulate the materials</b> necessary for the project.</p>		
	<p>6. Students <b>create their projects.</b></p> <p>Using the design process</p>		
	<p>7. Students <b>prepare to present their</b></p>		

	<b>projects.</b>		
	8. Students <b>present their projects.</b>		
	9. Students <b>reflect on the process and evaluate the projects</b> based on the criteria established in Step 4.		

TIMETABLE

ACADEMIC YEAR: 2010-2011

TEACHER: [REDACTED]

DAY	PERIOD	ASSEMBLY/ROLL CALL 8:10 - 8:20									
		1 8:20 - 9:00	2 9:10 - 9:40	3 9:40 - 10:20	BREAK 10:20 - 10:40	4 10:40 - 11:20	5 11:20 - 12:00	LUNCH 12:10 - 1:10			
Day 1	ELECTIVE	1-2	1-2	1-5		1-5	3-2		1:10 - 1:45		1:45 - 2:30
	1-4	1-4	1-4	1-4							
	1-2	1-2				1-1					
	READING PERIOD	planning									
	1-3	1-3	1-4		1-3 Library	1-1					
	1-4	1-4									
	1-4	1-4									
Day 2	ROLL CALL 1:00 - 1:10										
Day 3											
Day 4											
Day 5											
Day 6											

TE: RL is on 1<sup>st</sup> period every WEDNESDAY

Table showing the categories and codes derived from the Data

<b>Research Question One</b>	<b>Research Question Two</b>	<b>Research Question Three</b>
Ministry of Education personnel support- (1-S)	Subject content knowledge ( 2-SCK)	Integration across the curriculum
Training and Professional Development ( 1-TPD)	Resources -Tech Ed lab. -Funding - Lack of Library ICT equipment (2-R)	Maximising existing space
Colleague support across subject areas (1-CSS)	Timetabling ( 2-T)	Stages in Design
The use of General School Resources (-GSR)	Parental Involvement (2-P)	Incentives , Motivation (3-M)
Changing attitudes with communication (1-C)	In adequate support (2-IS)	Organising and Planning (3-OP)
	Communication (2-C)	Assessment (3-A)
	Collaboration And collegial support(2S)	Guided Discussion (3-D)
	Professional Attitudes and values	Comfortable Environment (3E)