TITLE PAGES

Teachers` Perceptions of the Enablers and Barriers to the Development of Student

Creativity in the Implementation of the SEMP Technology Education Curriculum: A

Multiple Cases Study of Serenity High

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ABSTRACT

This study sought to identify what the Technology Education teachers of Serenity High perceive as the enablers and barriers to the development of student creativity in the implementation of the SEMP Technology Education curriculum.

Teachers` perception on this research issue is important because creativity is an essential precursor to innovation and an important component of the design process within technology education.

The data for this qualitative multiple-case study was collected by interviewing, observing and analysing the artefacts associated with the teaching and learning experiences of six purposefully sampled Technology Education teachers from Serenity High.

The study found that the Technology Education teachers at Serenity High perceived the following as enablers to student creativity development: the IDEATE model problem solving model, collaborative learning, authentic assessment and supportive teacher behaviours. Whilst they perceived the main barriers to the development of student creativity to be a lack of: creativity training, financial support for resources, instructional time, and an explicit curriculum focus on creativity development.

Keywords: *Technology Education; creativity; creative pedagogy; teaching for creativity, teaching creatively, creative thinking, creative learning.*

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ABBREVIATIONS, TERMS & DEFINITIONS

ACOT =Apple Classrooms of Tomorrow

CARICOM = Caribbean Community and Common Market

CSME= CARICOM Single Market and Economy

CVQ = The Caribbean Vocational Qualification

GERM= Global Educational Reform Movement

EU= European Union

EuroStat = The European Union's Statistics Agency

IADB= Inter-American Development Bank

ITEA =International Technology Education Association

ITEEA =International Technology and Engineering Educators Association

IMF = International Monetary Fund

ICT= Information and Communications Technologies

SEMP= Secondary Education and Modernisation Program.

MOE=Ministry of Education

STEM= Science, Technology, Engineering and Maths (STEM)

NACCCE = The (UK) National Advisory Committee on Creative and Cultural Education

NCSE= National Certificate of Secondary Education

OECD =Organisation for Economic Co-operation and Development

UNDP= United Nations Development Programme

UNCTAD = United Nations Conference on Trade and Development

Definition of Terms

Technological Literacy – is a term that refers to one's ability to use, manage, evaluate, and understand technology (ITEA, 2000).

Technological design process - commonly known as an engineering design process, usually includes identifying a problem, investigating possible solutions, developing a plan, constructing and/or creating, evaluating, and communicating results(ITEA, 2000).

IDEATE Model - is a seven stage technology design process used by Technology Education teachers to help students to:1) I- identify a problem, 2) D- define the problem, 3) E - Explore possible solutions, 4) A - Access the various solutions, 5) T - Try-out and Test the solutions and 6) E - Evaluate the solution to the problem

Creative teaching -involves teachers making learning more interesting and effective by using imaginative approaches in the classroom it is an exercise of professional artistry (Cremin, 2009). That is the dual integrated practice of teaching creatively and teaching for creativity.

Teaching creatively- involves the use of imaginative approaches to make learning more interesting and effective (NACCCE, 1999)

Teaching for creativity- whilst *teaching for creativity* is defined as forms of teaching that are intended to develop young people's own creative thinking or behaviour (NACCCE, 1999)

Creative pedagogy- The concept of a creative pedagogy as an approach to creative teaching (Aleinikov,1989).

Enabler- an enabler gives one the opportunity to do something. Therefore the factors that support creative learning and innovative teaching have been called enablers. These circumstances or support mechanisms make creativity and innovation more likely to thrive.

Barrier- a barrier is a figurative phrase used primarily to indicate difficulties faced.

Inquiry based Learning- is a complex process where students formulate questions, investigate to find answers, build new understandings, meanings and knowledge, and then communicate their learnings to others.

Innovation - implementation of a new or significantly improved product (good or service) (OECD Oslo Manual, 2005)

Creativity - creativity within education is defined as an imaginative activity fashioned so as to produce outcomes that are both original and of value (NACCCE, 1999).

Creative self-efficacy- self-judgments of creative ability (Tierney & Farmer, 2002)

Ethos - the characteristic spirit of a culture, era, or community as manifested in its attitudes and aspirations (Oxford dictionaries, 2010)

Problem-based learning (PBL) -is an inquiry based learning instructional method in which students learn through facilitated problem solving.

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CHAPTER 1

The Global Perspective

According to Beghetto & Plucker, 2006 creativity is an essential component of problem-solving and other cognitive abilities, healthy social and emotional well-being, as well as scholastic and adult success. However despite the lack a standard definition for this complex multidimensional concept many researchers agree that a good definition of creativity should meet two important criteria: originality or novelty and task appropriateness or usefulness (Fisher, 2004; Kaufman & Sternberg, 2010).

Since creative persons have the ability to come up with new and valuable ideas creativity is seen as an important part of the milieu within which innovative processes are most likely to take place (Cohendet & Zapata, 2009; EU, 2009; Robinson 2010; Sawyer, 2011*b*). Therefore to ensure economic competiveness in an increasingly technology driven, knowledge-based global economy policymakers are being advised to invest in the development of a creative human resource base (Araya, 2010; Ananiadou & Claro, 2009; Florida, 2002).

Thus the rhetoric of creativity has been present in the international politics of education since the late 1990`s and largely in response to the aforementioned economic imperative (Bronson, & Merryman, 2010). However the findings of researchers such as Kimble 2009; Kim, 2011 provide evidence of a "creativity crisis" that reflects a misfit between the creativity rhetoric and the reality of education. Moreover the findings of the Adobe (2012) survey of 5,000 adults (1,000 per country from within the US, UK, Germany, France and Japan) show that only 1 in 4 people believe that they are living up

to their creative potential. Whilst over half of the respondents some fifty two percent (52%) expressed concerned that creativity is being stifled by their education systems (Adobe, 2012).

However despite the challenges there are pockets of success worldwide where the presence of creative teaching-learning experiences provide an enabling environment for the development of student creativity and deep meaningful learning (Hargreaves 2003; Hargreaves, & Shirley 2009; Kennedy, 2005 *a;* Sahlberg, 2011). According to the findings of Autio, 2009; Fisher, 2002; Fryer, 2003 this new paradigm in education requires that students be given opportunities to design and construct solutions to relevant, authentic and ill -defined problems in an environment that supports creative ideas .

Thus it has become common consensus for researchers to identify the discipline of technology education (called Design and Technology D&T in some countries) as a suitable context for the development of student creativity (Bartholomew, 2013; ITEA, 2000; Lewis, 2006, 2009; Resnick, 2008; Warner & Gemmill, 2011; Warner & Morford, 2004; Wong & Siu,2012).

According to the findings of McCormick & Davidson, 1996; Wong & Siu, 2012; Warner & Gemmill, 2011 creativity development is possible within technology education because the primary instructional method used in the technological design process (also called engineering process/technology process) engages students in problem based learning (PBL).Through this inquiry-based teaching-learning experience students creative abilities are encouraged as they are asked to identify a problem, investigate its many possible solutions, design and develop a plan, construct solutions and/or create artefacts

(the products of technology), evaluate them and communicate the results (De Luca, 1992; Hmelo-Silver, 2004; Isaksen et al., 2000; ITEA, 2000; Warner & Gemmill, 2011).

Grounded in constructivist theory the design process allows teachers to transform the classroom into an active inquiry based teaching-learning environment in which they can connect learning and creativity through the use pedagogical strategies (such as possibility thinking exploratory talk and situated learning approaches) to create intellectual estuaries (Awang & Ramly, 2008; Craft, 2013; Beghetto & Kaufman, 2009; McCormick & Davidson, 1996; Webster et al., 2006).

Simple, purposeful, heuristic, systematic and iterative the stages of the technological design process inextricably link design with creativity as they challenge students to learn to think divergently and find a balance between creative abilities such as analogical reasoning, synthetic abilities, practical abilities in order to produce innovative solutions (Cropley & Cropley, 2010; Lewis, 2006, 2009; Warner & Gemmill, 2011; Wong & Siu, 2012).

However whilst theoretically technology education as a discipline has the potential to make learning come alive for students as they connect their knowledge from diverse areas such as Science, Technology, Engineering, and Mathematics (STEM) in creative ways (Brown & Brown, 2010; Marshall, 2009).The findings of Brown, 2007; Hansen, 1995 shows that the possibility for development of creativity varies because ultimately the quality of curriculum implementation within technology education is a teacher and school-level phenomena.

Moreover the research evidence of Brown (2007) shows often there is evidence of a disparity in technology education classrooms between the official or intended curricula and experienced curricula. Thus leading Dixon (2013) to suggest that globally technology education is in need of standards such as those used by the US based International Technology Educators Association (ITEA) (called the International Technology and Engineering Educators Association (ITEEA) since 2010).

According to Lewis, 2006; Warner & Morford, 2004 the ITEA has through its standards for technological literacy (STL)(2000) stressed the need for developing student creativity by focusing on design within four of its 20 STL and by weaving the theme creativity in design throughout its many benchmarks. Recognising that STL`s alone are is insufficient for improving the overall quality of curriculum implementation ITEA in 2003 sought to provide more holistic curriculum support by also providing standards for student assessment and teacher professional development (Dixon, 2013).

The Regional Perspective

According to the research findings of Barrowclough & Wright, 2008 and Nurse, 2007, 2009 within the 21st century many of the Caribbean`s fastest growing jobs will rely on workers who have the ability to harness their creative capacity. As such to meet the demands in the increasingly competitive global economy researchers such as Bacchus, 2008; Hickling-Hudson, 2004; Jules, 2008; Louisy, 2010; Miller, 1999 suggest that Caribbean policymakers must revisit traditional concepts of 'knowledge' and commit to comprehensive reforms aimed at refashioning our education systems.

According to UNCATAD /UNDP (2008, 2010) the development of creative industries can have a highly transformative effect on income-generation, job-creation an export earnings thus making them attractive growth poles for regional economic development efforts such as Caribbean Single Market and Economy (CSME).

However despite the international success of many of the Caribbean's musical genres, recording artistes, literary authors and festivals the findings of Nurse (2009) show that the region maintained a deficit in the trade of creative goods for the period 2003-2008. Whilst researchers such as Dixon (2013) cautions that the benefits of technology education to regional development may be lost if fail to policymakers learn from the efforts of the ITEA over the years. Hence Dixon (2013) advises that the Caribbean needs to produce its own set of standards to ensure that its citizenry is characterized by high a quality of technological literacy and a holistic grasp of their own creative capacity.

The Local Perspective

Technology Education (referred to as Tech Ed in Trinidad and Tobago) became a compulsory part of the forms 1-3 core curriculum in 2008 (MOE, 2008). Dubbed the most innovative of the Secondary Education Modernization Program (SEMP) initiatives by the MOE (2008) the curriculum policy documents were aligned to the then governments vision 2020 desire to create innovative people for the 21st century.

According to the MOE (2008) this new curriculum required teachers of Agriculture Science, Home Economics and Industrial Arts make a radical pedagogical shift from their traditional product-based approach to teaching to a new process-based

approach to curriculum implementation which relied heavily on the inquiry based constructivist pedagogy of problem based learning (PBL).

According to the MOE (2008) curriculum guideline Technology Education teachers are to use the IDEATE model or *technological design process* to facilitate the development the following six essential learning outcomes: Aesthetic Expression, Citizenship, Communication, Personal Development, Problem Solving, and Technological Competence. However the findings of Joseph (2010) show that this has been no easy task as the early implementation of the SEMP Technology Education curriculum was significantly influenced by the failure of policymakers to engage and secure strong stakeholder buy-in and ownership of this aspect and many other aspects of SEMP reform initiative.

According to the findings of Ananiadou & Claro, 2009, Griffin, et al., 2012; Markkula, 2011 to prepare students for life in the 21st century and creativity as the essential link between education, innovation and economic productivity. Therefore this study seeks to understand what technology education teachers at a specific school perceive as the enablers and inhibitors to students creativity development in their implementation of the mandated Technology Education curriculum.

Researcher`s observations on the issue

As Trinidad and Tobago aspires to obtain innovative solutions to its economic, social and environmental problems there is an urgent need for education to focus on the development of student creativity. However the SEMP Technology Education curriculum

document makes only implicit and indirect references to the need student creativity development and it is not explicitly identified as an essential learning outcome.

Also since what is tested is often equated to what should be thought technology education teachers in Trinidad and Tobago have had very little incentive to make creativity development a priority. Especially since the rubric for the National Certificate of Secondary Education (NCSE) Technology Education places a negligible and conceptually narrow weighting on creativity. As a result there is an urgent need to determine the enablers and the barriers to the development of students' creative dispositions starting with my own school Serenity High.

Problem Statement

The research literature indicates that the Technology Education (Tech Ed) classroom represents a highly desirable context for the development of student creativity (Bartholomew, 2013; Cropley & Cropley, 2010; Lewis, 2006, 2009; Klapwijk, 2005). However Hennessey & Amabile, (2010) notes that in order for teachers to facilitate the development of student creativity teachers must have a clear understanding of the antecedents and inhibitors.

However having conducted an extensive search of research databases such as (MEDPRA, EBSCOhost, Questia, JSTOR, & Journal Seek) my evaluation of research literature on creativity development within Technology Education yields only a few studies linking technology education and creativity (eg. Cropley & Cropley ,2010; Klapwijk, 2005; Middleton, 2005; Rutland & Barlex, 2008; Warner & Gemmill, 2011; Webster et al., 2006; Wong & Siu, 2012) with non-specifically looking at the Trinidad

and Tobago context. As a result to the best of my knowledge there has been no specific research on the barriers and enablers to the development of student creativity in the implementation of the SEMP Technology Education within in the Trinidad and Tobago.

According to the research evidence from studies such as Davies, et al., 2013; Griffin, et at., 2012; Ferrari, et al., 2009; Tan, et al., 2009; Horng, et al., 2005; Rutland and Barlex, 2008 the enablers the development of student creativity can be classified within the following themes: 1) an understanding of creativity 2) teaching creatively and for creativity, 3) the use of creative thinking techniques and tools 4) the use of flexible, relevant and applied curriculum, 5) authentic assessment, 6) the practice of support for creative behaviours; 7) the development of positive social and emotional connections with students, 8) the use of an enabling psyco-physical environment with flexible time and space 9) access to resource materials and ICT.

Alternatively the findings of researchers such as Ferrari et al., 2009; Edinger , 2008; Davies, et al.,2013; Griffin, et at.,2012; Klapwijk, 2005 and Webster et al., 2006 suggest that the inhibitors to creativity development are the lack of: a creativity enabling curricula, creative pedagogies and assessment tools, teacher training in creativity development , professional competence, resources for teaching and learning such as ICT /digital media, and the negative influence of a performativity culture.

Purpose of the Study

By studying teachers` perceptions of the enablers and barriers to the creativity development in Technology Education this report hopes to draw attention to the beliefs, attitudes, behaviours and needs of Technology Education teachers` as it relates to the development of student creativity as an educational goal.

Thus this study hopes to reveal the status of creativity development within the Technology Education department at Serenity High and produce a report that can be used to provide the schools administration with the type of data they can use in planning teacher development programs. Particular attention will be placed on the removal of the perceived barriers whilst the enablers highlighted will be recommended for further strengthening and support.

Overarching Research Question

What do the Technology Education teachers at Serenity High perceive as the enablers and barriers to the development of student creativity?

This case study will operationalise the following three sub-questions:

Research Sub-questions:

1. How do the Technology Education teachers at Serenity High perceive student creativity?

2. What do the Technology Education teachers at Serenity High perceive as the enablers to the development of student creativity?

3. What do the Technology Education teachers at Serenity High perceive as the barriers to the development of student creativity?

Expected Outcomes

The findings of this paper will be limited to the data collected from teacher perception, observations and teaching –learning artefacts such as tests, charts and samples of students work. The answers to research question 1- should inform the researcher of teachers' knowledge of creativity concepts and indicate any possible need for creativity training.

Research question 2 would provide teachers` perceptions of the abilities, values, attitudes, strategies, tools, methodologies, techniques that aid them in developing students' creativity (enablers). Whilst research question 3 will reveal the social /organisational, pedagogical, and psycho-physical barriers and deficiencies that prevent teachers from being able to supports the development of students' creativity (ie. barriers). Overall the findings can give a general picture or status report on creativity development within the implementation of technology education at Serenity High.

CHAPTER 2-LITERATURE REVIEW

Introduction

This literature review is divided into three themes; the first theme titled "The nature of creativity in education" presents the reader with current research findings that shed light on the complex multi-faceted nature of human creativity. The second theme titled "Facilitating the development of student creativity" attempts to present a review of the key research finding on the factors that enable the development of student creativity within formal education. The final theme titled "barriers to the development of student creativity" summaries the research findings on the factors that inhibit the development of student creativity in the classroom.

The Nature of Creativity in Education.

According to the UK National Advisory Committee on Creative and Cultural Education (NACCCE) (1999) creativity in education is defined as an imaginative activity fashioned so as to produce outcomes that are both original and of value. Thus creativity in the context of education is conceptualized as a transversal, cross-curricular skill which everyone can develop (NACCCE, 1999).

However since learning is a creative process Runco (2003, 2007) suggest that the development of students` creative potential should be the primary focus of creativity development within education. Therefore to avoid teachers focusing on the production of unambiguous expressions of talent (ie forming a creativity bias) creativity should be defined in more literal terms such as creative thinking and problem solving which relate directly to students' self-expression (Runco (2003).

According to Amabile (2012) componential theory of creativity there are four components necessary for any creative response three at the level of each individual student (domain relevant skills, creativity-relevant processes, and intrinsic task motivation) and outside the individual i.e. the social environment in which the individual is operating.Hence Csikszentmihalyi (1988) systems theory of creativity suggests that ultimately, creativity is not about one thing, but about a system of things. According to Csikszentmihalyi (1988) creativity is the product of the interaction of the individual within a cultural *domain* that will ensure perpetuation of the idea, through a supporting institutional framework (*a field)* comprised of the stakeholders and *gatekeepers* who are socially embedded and capable of affecting the structure of the domain.

According to Sternberg & Lubart (1997) creative work requires developing the ability to balance three abilities: 1) synthetic abilities (come up with innovative ideas), 2) analytic abilities (critic of other people's ideas), and 3) practical abilities (sell ideas genuinely creative ideas) all of which can be developed within schools. Therefore to improve the quality and appropriateness of students` creative solutions the NACCCE (1999) recommends that teachers must engage in the simultaneous interrelated practice of both *teaching creatively* and *teaching for creativity.*

According to Jeffery & Craft (2004) teaching *creatively is* more concerned with 'effective teaching' as it involves the use of imaginative approaches to make learning more interesting (such as the use inquiry based teaching-learning approaches) whilst "*teaching for creativity"* can be interpreted being more concerned with 'learner empowerment' as it is intended to encourage the development of development of creative dispositions and creative thinking skills within young people. However the research finding of Jeffery & Craft (2004) note that two should only be separated for analytical purposes as effective creative teaching requires the integrated practice of the two to ensure long lasting effects.

This is important as the findings of Dietrich (2004) show that the functional neuroanatomy of human creativity is both emotionally and cognitively based as well as a spontaneous and deliberate activity. Using the findings of neuroscience Dietrich (2004) proposes four widely distributed the complex, multi-faceted forms of creative possibilities: deliberate-cognitive creativity, deliberate-emotional creativity, spontaneous-cognitive creativity, and spontaneous-emotional creativity.

Looking at the findings of Dietrich (2004) Weinschenk (2011) identifies the following implications for teachers: 1) deliberate and cognitive creativity requires a high degree of knowledge and lots of time 2) deliberate and emotional creativity requires quiet time and 3) spontaneous and cognitive creativity requires stopping work on a problem and getting away, and that 4) spontaneous and emotional creativity can't specifically be designed for.

Therefore even though creativity is often referred to as a singular attribute it is important that teachers have a broader conception of the widely distributed manifestations of creativity (Beghetto & Kaufman, 2007; Kaufman and Beghetto, 2009). Thus in recognition of the different levels, dimensions, transitions and gradations of creative expression Kaufman and Beghetto (2009) proposes the 4-C model of creativity.

According to Kaufman and Beghetto (2009) there is :1) *little-c* creativity – the creativity manifested in everyday problem-solving and creative expression(e.g., writing a poem) , 2) *mini-c* creativity – the creativity expressed as personally meaningful interpretations of experiences (e.g. interpreting a Jazz piece using the guitar), 3) *Pro-C creativity-* the creativity of professional acts (e.g. an architect designing a building) and 4) *Big-C* creativity- the acts of substantial or even legendary creativity expressed in a particular domain or genre (e.g. the work found in inventions, performances, scientific discoveries, and works of art of a classical composer like Mozart or Chopin).

Thus the 4-C model provides teachers with a guide for understanding the various manifestations of creativity even though students have different thinking styles (preferred ways of thinking). The model also illustrates the suitability of *little-c* or *mini-c* creativity

to more basic formal education as opposed to *Pro-C* and *Big-C* which both requires additional time to build expert domain knowledge (Kaufman and Beghetto, 2009). As such Beghetto & Kaufman (2011) note that teachers who are aware of the potential of *mini-c* are in a better position to draw it.

However Sawyer (2004) cautions that creative teaching is no easy task but an art as it requires '*disciplined improvisation*'. According to the findings of Sawyer, (2004,2011 b) creative teachers not only use more routines and structured activities than novice teachers but that they invoke and apply these routines in a creative an improvisational fashion. Whilst Sawyer`s initial use of the term 'disciplined improvisation' referred mainly to more to the 'how' of *teaching for creativity* more recently Beghetto & Kaufman (2011) have revised the concept to answer the questions of both *how* and *when* creativity can be facilitated.

According to Beghetto & Kaufman (2011) '*disciplined improvisation*' allows teachers to add unique fluid features to the learning of academic subject matter by reworking the *planned curriculum* in relation to the unanticipated ideas conceived, shaped and transformed under the special conditions of the *lived curriculum*. Thus teachers are able to use the naturally occurring gaps between the *planned curriculum* and the *lived curriculum* to explore opportunities for creative expression and the development of student creativity.

Facilitating the development of student creativity.

According to the findings of Sternberg & Lubart (1991) students require a confluence of six distinct, but interrelated, resources to be creative: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment. Whilst Feldhusen (1995) examination of metacognitive processing, the knowledge base, and personality variables show that these three aspects of an individual's creative thinking and production operate interactively and are the results of creative thinking.

However the findings of Sawyer, 2006; Seng, 2000; Sternberg, 1999, 2007 to be creative requires divergent thinking (a thought process or method used to generate creative ideas by exploring many possible solutions however most people use convergent thinking to respond in conventional and sometimes automatic ways .Therefore the research evidence of Dikici, 2014; Isaksen et al.,2000; Gardner,1999*a,b* ; Sternberg,1990 suggest that to facilitate creativity teachers must be able to assess and identify strategies that address the differences in students learning styles (in the form of multiple intelligences) and thinking styles (their preferred ways of thinking).

According to research findings Cremin et al.,2009 ; Cropley, 1997; Sternberg, & Williams, 1996 ; Soh, 2000 and Tan & Goh,2002 to be able to foster the development of student creativity in any subject teachers need to provide both cognitive and affective support by :1) emphasizing that everyone is capable of being creativity, 2) building students` creative self-efficacy by encouraging them to think creatively through the implementation of a meaningful relevant and applied curricula 3) modelling  their own creative behaviours and 4)  developing students` creative orientation and resilience by

allowing students to trust their own judgment whilst being tolerant of their dissent and independence as they define and redefine problems.

Specifically within technology education the design process offers special opportunities for creativity because of the "openness" i.e. its ill-defined problems, the existence of a variety of pathways to the solution and the absence of pre-specified "correct" solutions (Cropley & Cropley, 2010). However the findings of Craft et al., 2014; Esquivel, 1995; Grohman, & Szmidt, 2013; Shaughnessy 1991 show that for teachers need to maintain a creative pedagogy they must also build positive teacher-student relationships, de-emphasize standardized assessment and encourage students' possibility thinking (or "what if" thinking) by instructing and assessing students creatively.

Also to ensure that creativity becomes a habit for as many students as possible some researchers recommend that teachers use of cognitive thinking tools such as De Borno`s 1987 " six thinking hats" as well as thinking strategies such as creative problem solving and brainstorming (De Borno 2010; Fasko, 2001; Kassim, 2013, Scott et al., 2004).

Thus the findings of the Apple Classrooms of Tomorrow-Today (ACOT) (2008) show that to facilitate the develop 21st century skills such as creativity formal education must adopt the following six design principles:1) an understanding of 21st century skills, 2) the use a relevant and applied curriculum, 3) the develop a culture of innovation and creativity 4) the establishing of social and emotional connections with students, 5) the use

of informative forms of assessment and 6) ubiquitous access to information and communication technology (ICT).

Therefore in order to integrate student creativity into the everyday curriculum in ways that complement rather than compete with academic learning teachers need to have a broad understanding of the nature of creativity and a rich continuum of teaching and learning strategies (Kaufman& Beghetto, 2009; Kaufman & Beghetto, 2013).According to the research evidence of Scott et al., 2004; Hosseini & Watt, 2010 that teachers who are exposed to creativity training are better able to design and successfully implement of activities that facilitate the development of students' creativity.

However even though the findings of Scott et al.,(2004) show that well-designed creativity training programs typically induce gains in performance which can be generalised across different criteria, settings, and target populations. De Souza Fleith (2000) recommends that all creativity training should involve instructional planning, discussions and follow up observation as initial teacher training is insufficient.

Davies, et al., (2013) looking at several empirical studies published in the period 2005–2011 conclude there is a reasonable weight of research evidence to show that the following factors support creative skills development within formal education: flexible use of space and time; availability of appropriate materials; working outside the classroom/school; the use of 'playful' or 'games-bases' approaches with a degree of learner autonomy; respectful relationships between teachers and learners; opportunities for peer collaboration; partnerships with outside agencies; awareness of learners' needs; and non-prescriptive planning. Thus Davies et al., (2013) concludes that there factors that

the most influential factors on the development of students` creative skills are: the physical environment, the pedagogical environment and the role of partnerships beyond the school.

Since confidence is an important contributor to student creativity (Davies, 2000; Fryer, 1996; Kaufman& Beghetto, 2013; Kimbell et al. 1991).Kaufman& Beghetto (2013) note that it is important for students to develop creative metacognition (CMC) so that they can monitor and develop their creative competence. According to Kaufman& Beghetto (2013) creative metacognition is a combination of creative self-knowledge that includes knowing one's own creative strengths and limitations (ie creative self-efficacy) both within a domain and as a general trait as well as having contextual knowledge (ie knowing when, where, how, and why to be creative).

Also the findings of Amabile 1996; Hennessey, 2003, 2010 motivation plays a crucial role in the creative process. According to the findings of Jeffrey & Keynes, 2004 and Jeffery, 2006a giving students control over their learning, leads to ownership of knowledge and a greater the chance of creative learning which can result in innovation (the creation of something new or a major change such as the mastery of a new skill, or acquisition of new meaningful insight or knowledge).Hence the common characteristics of creative teaching and learning practices are: innovation, ownership, control and relevance (Jeffrey (2006*a*).

Since to the findings of Barron & Darling-Hammond, 2008 *a, b*; Jackson, 2003; Frank, 2005 inquiry-based teaching learning strategies such as problem based learning (PBL) facilitates positive changes in motivation, attitude toward learning, and the development of skills such as creativity and critical thinking. Rutland &Barlex (2008)

conclude that technology education has the potential to facilitate the development of student creativity as it uses authentic inquiry-based teaching learning strategies such as PBL and design-based instruction.

However the findings of Rutland & Barlex (2008) point to the need for teachers to use interesting, motivating and relevant projects with exciting starting points and stimulus materials in order to develop and open the pupils' creative minds (ie implement an authentic relevant curriculum). According to the ACOT 2 (2012) curriculum should have the following six key characteristics: 1) collaboration and community 2) authenticity and relevance 3) the ability to leverages real-world tools, resources, and methodologies 4) incorporate a rich continuum of teaching and learning strategies 5) and be grounded in rich content within a 21st century context 6) that creates linkages to the outside world.

According to the research evidence of Barron & Darling-Hammond, 2008 *a*; Bore, 2006; Burnard et al., 2006; Johansson, 2004 group work is a central characteristic of PBL facilitates co-opoerative and collaborative learning and student creativity. According to the research findings of Sawyer, 2004; Johansson 2004; John-Steiner,2000 the diversity, tension, from the intersection of ideas, concepts, and cultures as well as the sharing of knowledge associated with student communication in groups facilitates creative insights and the development of new or emergent knowledge, not possessed before ("the Medici effect").

According to the findings of Cremin et al.,2006; Gkolia et al.,2009; Greene, & Noice 1988 teachers can establish positive social and emotional connections with student by listen to their questions and giving then a voice and setting high expectations whilst

allowing students to take risks within a structured and supported environment. Also the findings of Besancon & Lubart, (2008) show the overall ethos and learning environment of a school can account for variance in children's creative performance scores. Thus Jeffrey & Woods (2009) identifies the three major features of creative learning within schools are developing positive teacher–learner relations, engaging student interest and valuing students` contributions whilst Cremin (2009) identifies curiosity, connection making, autonomy, ownership and originality as the key features of a creative teachers' pedagogical practice.

According to the findings of Cropley & Cropley, 2010; Doppelt, 2009; Fleenor, & Taylor, 2004; Reeves & Okey, 1996 show that   alternative authentic assessments tools can be used   for diagnostic, formative and summative   assessment of creativity. According to Griffin et al., 2012; Lucas et al, 2013; Spencer et al., 2012 creativity assessment has to two clear benefits: 1) teachers will be more precise and confident in developing young students` creativity, and 2) learners will be better able to understand what it is to be creative and to use this understanding to record evidence of their progress. Specifically for Technology education Cropley & Cropley (2010) "functional" model of creativity offers teachers guidelines for making students understand what they are expected to achieve with their designs and for diagnosing the creativity of their designs.

Therefore teachers need to have the autonomy to create much of their own curriculum and the professional confidence to re-connect their practice to social and educational ideals (Dondero, 1997; Grainger et al, 2004, 2006; Hargreaves, & Shirley 2009; Sahlberg, P. 2009 b; Shaughnessy 1991). Thus whilst Gurteen (1998) suggest that

is a triangular relationship between exist between innocence, creativity and innovation the findings of Tierney & Farmer (2002) show that job tenure, job self-efficacy, supervisor behaviour, and job complexity all contribute to teachers creative efficacy beliefs (which influence their creative performance) can protect teaching professionals.

Also there is also strong evidence to show that partnerships beyond the school with persons and organisations that embody and exemplify innovative practice (such as artists and other creative professionals) can significantly contribute to student creativity (Burgess & Addison, 2007, Downing et al., 2007; Gkolia et al., 2009, Hall & Thomson, 2007, Halsey et al., 2006, Jeffrey, 2006*a*; Sharp et al., 2006; Wyse & Spendlove, 2007). Thus Cremin (2009) describes creative practice as the result of a dynamic, multi-layered interplay between teacher's personal qualities, the pedagogy they adopt and the ethos developed in the class and school each of which have a distinctively creative orientation

The findings of Loveless, 2002; Ferrari et al., 2009; Wood & Ashfield, 2008 show access to ICT and the procession of relevant ICT skills enables both teachers and learners to be creative. According to Loveless (2002) digital technologies have the potential to support creativity by assisting in development of ideas; making connections; creating and making; collaboration; communication and evaluation; and engaging in physical and virtual learning environments. For example the findings of Wood & Ashfield (2008) show that the use of ICT such as interactive whiteboard have special features such as interactivity, speed, capacity and range which enhance the delivery and pace of the teaching learning process and enables the development of student creativity. Thus

teachers need to frequently reassess their role in the learning process and to be able to leverage technology in ways that enable student creativity and learning

According to the research evidence of Evanshen & Faulk, 2011; Oblinger, 2006; Graetz, 2006 the sensory qualities of the learning environment such as light, colour, sound, and physical space can influence students creativity. As such the findings of Rashmi, 2012; Jensen, 2003 highlight the importance of managing the over-arching influence of "psycho-physical environment" on the development of students' creativity.

Thus to proactively facilitates the development of student creativity a teachers need to be committed to creating an enabling stress free environment that is: emotionally safe and supportive, healthy clean and well-light, uncluttered and well laid out for multiple uses, pleasant smelling and aesthetically pleasing with calm colours, plants and music as well as supplied with multiple resources to be used for topics of study (Graetz, 2006; Evanshen & Faulk, 2011).

Also there is a significant quantity of research evidence which show that expressions of creativity can be facilitated through the flexible use of time (Addison et al., 2010, Burnard et al., 2006, Cachia, et al., 2009, Halsey et al., 2006; Jeffrey, 2006*a*;). For example within Technology Education the findings of Webster et al. (2006) showed that the incorporation of an incubation period or a period of non-focussed thinking within the technology process facilitates student creativity. Therefore students need sufficient time for the mind to wander in relaxed uncompetitive environment and for immersion in an activity in order to realise its creative outcomes (Burnard et al., 2006 and Webster et al., 2006).

According to the findings of Cachia, 2009; Jeffrey 2006 and Halsey et al 2006 the timetabling of special extended time periods for creative activities increases student interest and commitment to creative learning. Thus the availability of resources outside timetabled hours acts as a creativity-enhancing factor as it allows students to work at their own pace without pressure.

Barriers to the development of student creativity in education.

Even though Technology Education is premised on the importance of the act of designing and the value of the contingent activity of creative thinking there continues to be a great deal of uncertainty about methods for developing students creativity within the discipline (Middleton,2005).

According to the findings of Klapwijk (2005) there are three reasons why technology education (or Design and Technology) teachers are often unable to nurture student creativity: 1) the infancy of understandings of creativity in the discipline, 2) teachers failure to open the learning processes and introduce ambiguity because of a lack of knowledge and self-confidence in the fields of technology and science and 3) a general the lack of experience in creative educational practices.

Therefore whilst technology education has the potential to motivate children to be creative curriculum policy alone does not guarantee that educators adopt an effective creative pedagogy (Campbell & Jane, 2012). As such students are almost never taught or assessed in a way that matches their unique pattern of abilities (Sternberg, 2006). In fact the findings of Stricker (2008) show that relative to art and music teachers' technology

education are least interested in the importance of the creative process even though they all perceived the creative process as important to creative work.

According to Cropley & Cropley (2010) teachers are often left with more questions than answers when confronted the need to develop students' creativity. Specifically as it relates to design pedagogy technology education teachers are left with questions such as: 1)how to specify which designs are creative and why, 2) how to identify where the creative strengths of designs lie so that students can build on these and 3) what advice to give on how to change designs to make them more creative (Cropley & Cropley (2010).

Moreover Davies (2000) found that teachers felt that whilst creativity has a role in the teaching and learning of the subject, some thought it should subservient to the development of the areas of knowledge and skill especially since these were the areas in which individuals were the most confident. Especially since Sternberg (2003) notes that schools generally undervalue creativity as teachers tend to think that creativity is no different from general intelligence. Thus Schacter et al. (2006) evaluation of forty-eight upper elementary school teachers' classroom instruction show that the majority of teachers do not implement any teaching strategies to foster student creativity and that high proportions of minority and that low-performing students receive significantly less creative teaching.

Therefore an analysis of Rashmi (2012) the four elements model of an effective creative pedagogy shows that there are barriers to the development of students' creativity within all four components of the model. The psycho-physical environment, teachers

ability to *teach creatively as well as teach for creativity* as well as habitual and perceptual blocks to teachers own creative thinking skills Rashmi (2012).

According to the findings of Aljughaiman &Mower-Reynolds, 2005 and Westby &Dawson, 1995 many of the teachers who claim to value creativity fear that inviting creativity into the classroom will result in curricula chaos. Whilst the findings of Weisberg (1986.1993) show that many teachers continue to hold on to myths and misconceptions about creativity such the notion that creativity is a fixed, innate and randomly assigned characteristic amongst human beings determined by special genes.

Thus Robinson (2006) notes that schools kill creativity when teachers who lack the relevant creative pedagogy adhere to behaviourist; teacher centred whole class teaching practices which place emphasis on convergent thinking and limits opportunities for development of divergent thinking that leads to creativity. Such environments communicate subtle messages that inform students that creativity has no place in classroom thus deterring student creativity (Robinson, 2006; 2010).

Also research shows that teachers often have biases toward creative students which discourage them from engaging in creative behaviours and developing creative dispositions (Aljughaiman & Mower-Reynolds, 2005; Beghetto, 2007 and Scott, 1999). In fact Beghetto (2007) found that teachers' preference for unique responses varied as a function of grade level and academic subject area.

 However according to the findings of Brown 2007; Dakers , 2005; Hansen ,1995; Zuga,1999 show that many technology education teachers have a curriculum orientation that reduces the teaching learning experience to the simple acquisition of a limited set of broadly based mastery skills for the handling of materials and tools.. Locked with a

transmission model of education these teachers stifle creativity and perpetuates what Dakers (2005) refers to as a hegemonic behaviourist cycle of education designed specifically to correspond with the perceived needs of industry at that time.

Thus leaving students increasingly unable to engage in informed debate about the ways in which technology is shaping and dominating society or opportunity to re-construct creative and meaningful alternative solutions (Dakers, 2005; Jardine, 1992). According to Hansen (1995) this often happens because relative to a curriculum that is prescribed it is often more difficult for teachers to explore the genesis a curriculum as a professional and decide for oneself if the curriculum content and process encompass what they should. Thus many technology education classrooms are fraught with teaching practices and programme features that differ significantly from the intended curriculum (in ways which serve to kill student creativity).

According to Kline (1985) innovation is not a linear process. As such even though the use of the technological design process is well established within the underpinning structure for technology education it is important to note that some formal theories of design (such as 'C-K theory') fail to account for the generation of creative ideas (Hatchuel & Weil 2009) whilst others such as Hatchuel et al. (2009) analysis of the KCP process do. Also despite the promising nature of the theory of the relationship between PBL and creativity Tan, Chye, & Teo (2009) literature review on PBL and creativity suggest that claims of the effectiveness of Problem Based Learning (PBL) on creativity development, lack systematic empirical support.

Moreover the research findings of Edelson, et al. 1999; Krajcik, et al.1998; Owen-Jackson,2013 show that teachers lack often lack the expertise to (*teach creatively*) effectively implement meaningful inquiry based teaching- learning approaches such as problem based learning (PBL). When teachers don't fully understand the complexities of inquiry-based learning and fail to provide students with proper scaffolding, modelling and assessment that facilitate meaningful learning and creativity development (Edelson, et al. 1999; Krajcik, et al.1998; Owen-Jackson, 2013).

Thus poor quality inquiry based teaching learning experiences it can have a detrimental impact on children's creativity and learning as they often have difficulty generating the meaningful the "driving questions" or "evaluating questions" to facilitate the deep learning and creativity (Edelson, et al. 1999; Hmelo-Silver, 2004; Krajcik, et al., 1998; Runco, 1994). Also the findings of Klapwijk (2005) Technology Education show that teachers are often not fully equipped to introduce open up to learning processes to the ambiguity need to fostering student creativity because of they lack self confidence in the field of technology and science.

According to the findings of Achilles & Hoover, 1996; Krajcik, et al., 1998; Edelson et al., 1999 students involved in poorly implemented PBL often find it hard to be creative as they have difficulty managing their time, working collaboratively and sustaining motivation in the face of setbacks or confusion. Moreover Mawson (2003) examination of the influence of design models on teacher's classroom practice suggest that the current paradigm for teaching technology education through the design process is flawed and in need of an alternative pedagogy.

Also Kennedy (2005*b*) shows there are several different ways in which classroom life can undermines creativity reform for example the negative stress associated with in small cluttered spaces, limited resource material and a lack of ICT resources and a rigid inflexible classroom time inhibits students' creativity development. The lack of Information and Communication Technologies ICT /digital media makes *creative teaching* a challenge as teachers find it more difficult to teach creatively without the advantage of technology (Davies, et al., 2013; Edinger, 2008; Ferrari et al., 2009).

Without the availability of ICT /digital media teachers often stick to traditional teacher-centred teaching approaches forces students to rely principally on convergent thinking, memorization and recitation of material (Ferrari et al., 2009; Davies, 2000). Also Goktas et al., (2009) notes that "one-off ICT training" is not sufficient to encourage the development of appropriate pedagogical practices as the technical mastery of ICTs enables the creative teaching required to develop student creativity

According to Rasmussen et al., (2014) performativity is a technology, culture and mode of regulation that displays the performances of individual subjects or organisations to serve as measures of productivity by employing comparisons and judgements that increasingly there exists within most education systems. According to the research findings of Ferrari et al, 2009; Robinson 2006 and Sahlberg , 2009 *a, b*; the pressures of a performativity culture associated with the centralised control over curriculum favours the use market based features such as test-based accountability, standardisation, and competition which are antagonistic to both student and teacher creativity.

A performativity culture that fosters blame, de-professionalism erodes the teachers autonomy and curriculum flexibility required to develop student creativity. Similarly educational reform to encourage creative teaching is ineffective in a toxic organizational which undermines teacher autonomy and professional confidence and sense of creative self-efficacy (Burnard & White, 2008; Edinger, 2008; Hargreaves, 2003; and Sahlberg, 2009 *b).*

When teachers' professional confidence is eroded *teaching to the test* becomes the priority as teacher self –interest is preserved at the expense of efforts to focus on the development of students' creative knowledge, skills and habits of mind or dispositions (Sahlberg, 2009 *b*). In the face of prescribed inflexible and overloaded curricula many teachers experience calls to facilitate the development of student creativity as just another addition to an already-overwhelming set of curricular demands (Beghetto, 2010).

According to Loveless (2002) methods for the assessment of creativity are often not straightforward and only a few of the many instruments tested have been able to measure the concept adequately. As even though Rogers & Fasciato (2005) highlight the need for consensus among teachers on a definition of creativity the incommensurate mix of conflicting conceptual underpinning and perspectives informing creativity results in *tensions and dilemmas* that inhibits efforts to assess creativity. Among then conflicts such whether creativity is context-free vs domain-situated or social vs individualised must be addresses. Craft (2005; 2008).

Also the findings of Bolden et al. (2010) show those teachers are often do not have information about creativity to be able to specifically identify the

indicators of creativity and effectively assess it. So much so that whilst a newly qualified teachers conceptions of creativity becomes less narrow with creativity training many still have difficulty in identifying ways of assessing creativity in the classroom (Bolden et al., 2010).

Thus in conclusion some of the more frequently identified barriers to the development of student creativity within the research literature are: 1) teachers lack of knowledge about creativity and an the appropriate creative pedagogy, 2) creativity assessment tools, 3) adequate time, space, within an enabling psyco- physical environment 4) the lack appropriate manipulative and ICT resources 5) the pressures of a 'performativity culture' (Davies, 2000; Ferrari, et al., 2009; Edinger , 2008)

Conceptual Framework

PERCEPTION

Teachers play an important role in developing student creativity (Beghetto & Plucker, 2006)**.** Hence teacher perceptions creativity and the characteristics of creative students reflect their implicit theories and influence their behaviour towards creativity development (Runco et al, 1993; Runco & Bahleda, 1986; Runco, Sternberg, 1985).

Therefore Technology Education teacher perceptions of the enablers and inhibitors to the development of student creativity represents an important source of information as they reflect the way these teachers view and understand the concept   and the way they are inclined to behave. Also this research takes recognition of Gregory (1970) 'top-down' constructivist (indirect) theory as he posits that culture, as well as educational background have can influence a teacher perceptions or personal understanding.

In an effort to condense and analyse the data collected from in this study following three diagrams will outline the conceptual framework that will be used for an analysis of the enablers and inhibitors to the development of student creativity in within this study:

1) The ACOT (2008) six design principles for developing 21st century skills

2) Cremin (2009) three-dimensional framework for creative teaching.

3) Rashmi (2012) four elemental model of a creative pedagogy.
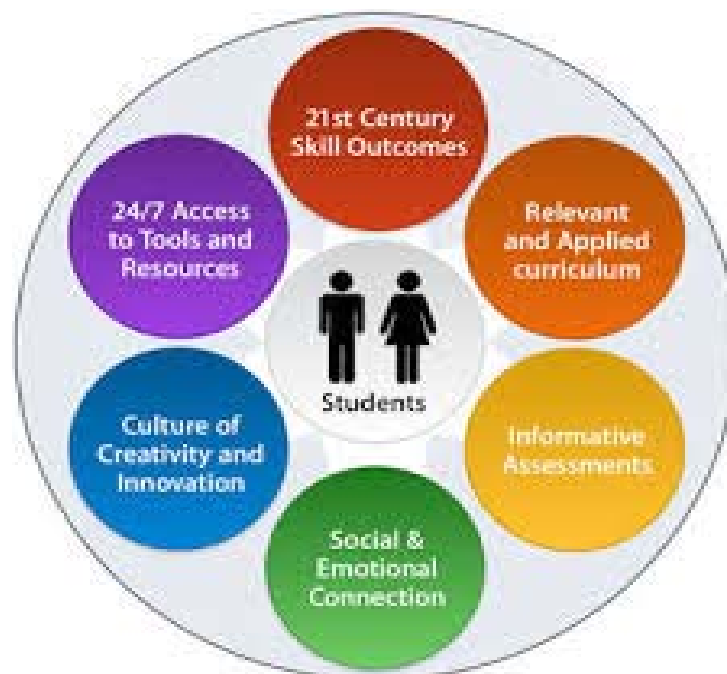
Fig 2.1 The six design principles for developing 21st century skills
Source: /Apple-ACOT2Whitepaper.pdf.
Apple Classrooms of Tomorrow-Today Report (2012): Learning in the 21st century

According to the (ACOT, 2008; ACOT2, 2012) the six design principles for developing 21st century skills are : 1) an understanding of 21st century skills and outcomes, relevant and applied curriculum, informative assessment, a culture of

innovation and creativity, social and emotional connections with students, and ubiquitous access to technology.

FRAMEWORK FOR CREATIVE TEACHING
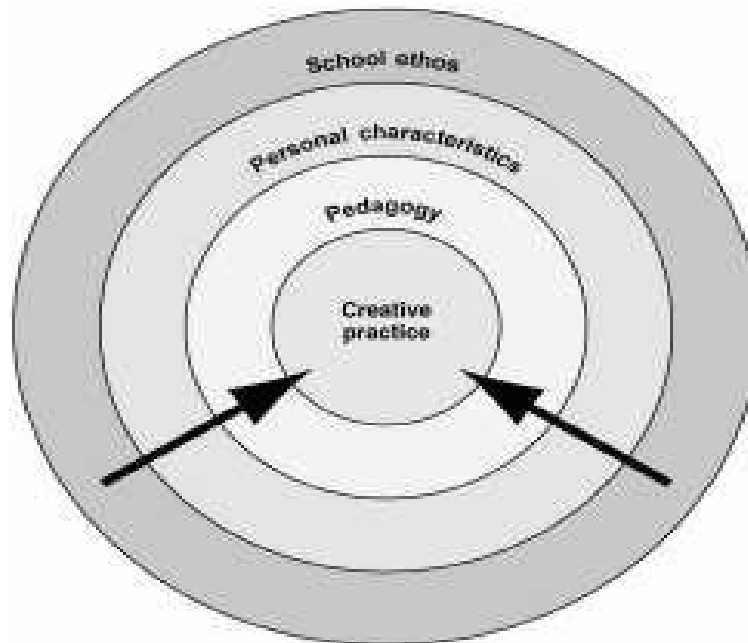
Fig 2.2   Diagram to represent a framework for creative teaching

Source : Cremin, T. (2009). Creative teachers and creative teaching. *Creativity in Primary Education. Exeter: Learning Matters*.

The diagram above represents Cremin (2009) three-dimensional framework for creative teaching in which he describes creative practice as multi-layered experience that encompasses three dimensions, namely the teacher's personal qualities, pedagogy and ethos, each of which has a distinctly creative orientation.
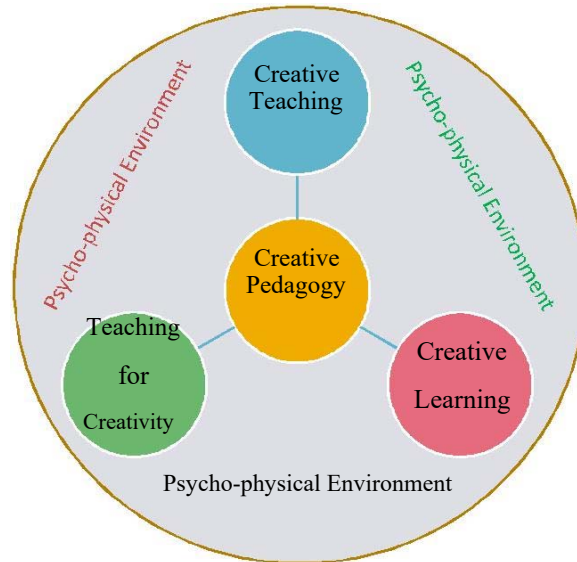
Fig 2.3   Diagram showing (Rashmi, 2012) Four Elemental Model of a Creative Pedagogy.

Source: Rashmi, R. (2012). Fostering Creativity: A Four Elemental Model of Creative Pedagogy. *Journal of Education and Practice*, *3*(12), 190-201

Rashmi (2012) puts forward a four element pedagogical framework for a creative pedagogy that consists of :1) creative teaching, 2) teaching for creativity, 3) creative learning all of which are conceptualised as integrated and interrelated elements within 4) an over-arching psycho-physical environment. The psycho-physical environment is over-arching combined effect of the physical environment and the psychological influence of the environmental context all of which influence an individual's creativity these include elements such as the positive or negative stress due to cleanliness, a feeling associated with space, lighting, and ambience etc.(Rashmi, 2012).

CHAPTER 3-METHODOLOGY

Rationale for the use of a qualitative approach and a multiple case study design.

Qualitative Research Approach

In an effort to present a detailed view of the topic being studied in a natural setting this study employs the use of a qualitative research approach. According to Creswell (2012) the qualitative research approach as an inquiry process allow the researcher to build complex, holistic pictures, analyse words, report detailed views of informants, and conduct a study in natural setting. Palton (1990) suggest that through the qualitative research paradigm the researcher's manipulations of the natural settings is minimised and no limitations are placed on the outcome of the research. The qualitative approach allow the researcher to make sense of or to interpret phenomena in terms of the meaning people bring to them (Denzin and Lincoln, 2000).

Since the researcher's role is more that of an active learner instead of an expert judging Creswell, (2012) notes that qualitative research paradigm through its concern with process more than simple outcomes allows the researcher is able to gain individual perspectives through intimate conversation with the respondents to create meaning and uncover the lived experiences of the respondents. Thus allowing the researcher to be able to understand in depth both the characteristics of the situation and the meaning brought by participant's introspection of what is happening to them at the moment (Creswell, 2012).

Multiple-case study design

According to Mills, Durepos & Wiebe (2009) a multiple-case design involves the extensive study of a number of instrumental case studies which may be conducted at one site (e.g., a school, hospital, or university) by examining a number of different departments or other units. Thus, allowing for more direct comparison of the similarities and differences between the implementation practices (Mills, Durepos & Wiebe, 2009).

To develop a more in-depth understanding of the phenomena than a single case can provide this research design allows for several instrumental bounded cases to be selected (Mills, Durepos & Wiebe, 2009). Since each case study is based on multiple sources of evidence the case study's unique strength is "its ability to deal with a full variety of evidence such as documents, artefacts, interviews, and observations" (Yin, 2003 p.8). Thus Yin (2003) notes that the multiple case study design reflects positively on the validity of the qualitative data provided and has an overall higher quality than those that rely on a single source of information.

Rationale for the sampling procedure used

A purposeful sampling procedure was used to select the participants for providing the information-rich cases related to the goals of the study (Patton, 2005). According to Merriam, (1998) purposeful sampling is used so that the most can be learned about the research question. As such the intent is to achieve an in-depth understanding of selected individuals by selecting a sample that will accurately represent a defined population (Gall, Gall & Borg, 1999).

According to Patton (1990) stratified purposeful sampling is a type of purposeful sampling that illustrates characteristics of particular subgroups of interest and facilitates comparisons between the different groups. The purpose of a stratified purposeful sample is to capture major variations rather than to identify a common core, although the latter may also emerge in the analysis. Each of the strata would constitute a fairly homogeneous sample (Patton, 1990).

Sampling framework for case selection

In order to ensure the selection of information-rich cases this sampling framework was used to identify the defined points of variation along which six Technology Education teachers from among the eight Technology Education teachers at Serenity High will be chosen:

1. –teacher`s length service teaching Technology Education

2. – teacher`s exposure to Technology Education Training

3. – teacher`s academic content specific qualification or academic background.

4. - teacher`s Instructional Level

Profiles of the participants and the school forming this multiple case study.

Serenity High is a rural seven year secondary school located in South Western Trinidad. Prior to 2008 Technology Education was not implemented at Serenity High even though some teachers had been trained. However in response to the MOE mandate Technology Education introduced at the beginning of academic year 2008- 2009 and the long awaited resources (Four portable teach Ed labs) arrived in 2009.

Table 3.1

Participants Bio-Data

Pseudonym	Tech .Ed Instructional Level	Teacher Tech. Ed. Trained	Teacher Specialisation / Academic Background	Length of Service
Natalie	Forms 2 and 3	No	Mechanical Technology - *Bsc .Mechanical Engineering*	3 months
Jane	Forms 1 and 2	Yes	Building and Construction Technology- *Diploma in Civil engineering*	2 years
Peter	Forms 2 only	Yes	Electrical/Electronic Maintenance - *Diploma in electrical Electronic Maintenance*	4 years
Tim	Form 1 and 2	Yes	Building and Construction Technology- *BEd*	14 years
Collin	Form 3 and 1	Yes	Agricultural Science- *Bsc Agriculture Science*	30 years
Cindy	Forms 3 and 2	Yes	Food and Nutrition - *Bsc-Family & Consumer Studies*	12 years

In the context of this research it is important to note that teachers entering the profession before 2008 were mandatorily converted to Technology Education teachers

whilst those coming into the profession within the last seven years did not have that experience. Within this group Tim, Collin and Cindy were converted to Technology Education teachers in-service through the SEMP reform whilst teachers Natalie, Jane and Peter knew they were expected to teach Tech Ed before accepting the job. However it is important to note that none of these teachers have themselves been Technology Education students.

Instruments used to collect data

In line with the recommendations of researchers such as Patton (2005); this study obtained qualitative data from direct fieldwork observations, in-depth open-ended interviews, a reflective journal and document analysis.

Reflective Journal (see an excerpt in Appendix *e)* journaling was done throughout the study following interviews, document analysis, observations to provided additional data for analysis. According to Morrow & Smith (2000), the use of a reflective journal adds rigor to qualitative inquiry as the investigator is able to record his/her reactions, assumptions, expectations, and biases about the research process.

Semi-structured interviews (see Appendix *c* for the teacher interview protocol), used open ended questions in order to get as much details as possible from the respondents. According to Cohen et al. (2005) open ended questions permit deeper probing to elicit rich thick descriptions in the respondents own words within the context of their lived experiences.

Field Notes – Bryman & Bell (2003) note the importance of field notes to qualitative research given the as the main instrument for data collection. Therefore

keeping good systematic field notes was essential as observations and interviews are only useful to the extent that they can be remembered.

Non-Participant observations were done to gain additional information about the process of facilitating student creativity (see Appendix *d* for an observation checklist).

Document Analysis -Through analysis documents served to triangulate and give voice and meaning to the statements made by respondents in the interview (Creswell, 2012). Documents analysis involved coding content into themes from time tables, schemes of work, charts, assessments and lesson plans

Ethical Considerations and Safe Guards

The Inside Researchers Critical Self-Analysis –

According to Costley (2010) the unique perspective of the insider researcher inevitably makes a difference to the research as the researcher's situatedness and knowledge of context are important aspects of qualitative research. Thus the 'inside' researcher is well placed to depict a more genuine image of the reality of the research interest because of their socio-cultural immersion in the field (Pring, 2000; Louisy, 1997). Thus the criticisms and general critique of insider research is balanced against the value of work based projects so much so that the researcher has a right to acknowledge possession of expertise and experience in the professional field that gives me an advanced level of knowledge of issues (Costley, 2010).

Though I am not a Technology Education Teacher I am aware that as a teacher and a member of staff at the school under investigation. It is possible that the subjective nature of researching from the inside researcher's perspective can result in a lack of impartiality and problems obtaining a fresh and objective view. To guard against bias in this insider researched study, the following recommendations form Costley (2010) careful attention was paid to feedback from participants as well as the evaluation of data through triangulation of the methods of gathering data.

To undertake this study permission for was sought from the MOE (see Appendix *g*), as well as and the participants involved in the study. Informed consent was sought from the participants (see Appendix *a*) and the anonymity and confidentiality of respondents and cautions taken to ensure that all persons felt safe, comfortable, and free to withdraw from the study if they feel the need to.

Validation Strategies

The meanings emerging from the data have to be tested for their plausibility, sturdiness, or 'conformability' in order to determine validity (Miles and Huberman, 1994). According to Patton (2005) in qualitative research the validation concerns seek to determine if the conclusions being drawn from the data are credible, defensible, warranted, and able to withstand alternative explanations. As such to ensure validity this study using Creswell & Miller, (2000) recommendations used member checking, triangulation, researcher reflexivity, and thick rich descriptions to ensure credibility.

Transferability, faithfulness, and dependability

However Creswell & Miller, (2000) note that validity as an issue for qualitative research is more about transferability, faithfulness, and dependability rather than reliability and validity as the meanings communicated in the findings depend on knowing the relevant context. Therefore to ensure that readers are able to make decisions about transferability, faithfulness, and dependability this study makes use of verbatim thick rich descriptions in an effort to present the voices of respondents that relate to the emerging themes as well as detailed description of each case Creswell & Miller, (2000). Finally to ensure credibility Creswell & Miller, (2000) the following key questions be asked about data collected and the interpretations made:

1. Is the data based on one's own observation, or is it hearsay?

2. Is there corroboration by others of the observation?

3. Under what circumstances was an observation made or reported?

4. How reliable are those providing the data?

5. What motivations might have influenced a participant's report?

6. What biases might have influenced how an observation was made or reported?

My Experience Conducting the Study

Timeline- This study was conducted over a period of six weeks between the months of (November and December, 2014).

 How the study began.

I have for years observed Technology Education students preparing their projects and portfolios and admired the possibilities for creative self-expression that the practical nature of the subject provided to students. More recently with the Council for Competitiveness and Innovation (CCI) attempts to highlight its support for creativity, innovation and entrepreneurship and the Ministry of Planning and Development declaring its desire to facilitate the development of a creative industries as it aspires to make Trinidad and Tobago into an information economy. I became interested the potential for creativity development within Technology Education and wanted to get an understanding how teachers were doing in their efforts to facilitate the development of student creativity within Technology Education.

As such the study was proposed the principal of Serenity High and approval to conduct the study was obtained from the school`s principal, district supervisor and the Ministry of Education. The potential participants were informed about the study and given the opportunity to make an informed decision on whether or not to participate orally as well as in writing. And they were asked to sign to indicate their consent having read a copy of the informed consent form seen in Appendix *a*.

Changes made along the way.

Initially I started the study by focusing one only three cases (having chosen a teacher from each of the three instructional levels for the Tech Ed curriculum).However this number was later expanded to six as the guidelines for outlined by Stake (2006) suggested the number of cases should be no less than four. This meant that instead of the data collection being done in three weeks the time was doubled. I tried to transcribe the interview data as soon as possible following the interviews however this was not easy and often found that I had to go back to the participants for to obtain further clarifications. Once the interviews were transcribed I was happy that I had taken photo copies of them as there were several changes made in forming codes and categories which were grouped and regrouped many times. However a review of the field notes taken during interviews and document analysis proved extremely helpful for interpreting the data for themes. The Final analysis of the case was also a tedious exercise and once again I had to re-familiarise myself with the literature however the conceptual framework and the research recommendations from my checklists aided in this task.

Hours spent in the field

Each of the six respondents was interviewed for approximately 30 minutes three times. Whilst they were observed three times for approximately 270 minutes each. Therefore an approximate a total of 36 hour direct hours were spent in the field however a significantly larger amount of time was spent trying to analyse the data collected following each field visit.

Data Analysis

With multiple case studies, data are analysed for insights both within each case and across cases (Stake, 2006; Merriam, 1998). As such the data collected in this study was analysed case by case through thematic analysis and later by thematic cross-case analysis.

Identification of individual Case Themes

In this study, the participants' responses to the interview questions were transcribed verbatim in the word document and printed out as transcript for the thematic analysis. The data for every case was scrutinized line by line using the open coding method to form codes and categories using the following six phases outlined by Braun & Clarke (2006 p. 87): (a) transcribing data, (b) generating initial codes, (c) searching for themes (recommendations), (d) reviewing themes, (e) defining and naming themes, and (f) producing the report.

Within each individual case data triangulation was done to ensure consistency across different data sources (eg interview data was compared against observational data which was compared with the field notes from document analysis). Following this the cross-case themes were identified for cross- case thematic analysis to determine the relevance of each case for the cross-case themes.

Identification of Cross Case Themes

After all data were entered and coded for individual case themes, the data were re-analysed for emerging cross case themes. Initially the individual case themes were

compared to determine the existence of useful multi-case information support the themes that adequately explain cross-case patterns or any common themes among participants.

The added multi-case themes were the result of an analysis of the words and phrases utilised throughout multiple documents acquired through the data collection process (manifestations) and the relative importance of specific statements made within the individual cases (the unusualness or ordinariness) (see appendix *f*- worksheets for a sample of Summary sheets used in the cross case analysis). Cross case analysis also helped in understanding when and why there are differences among case themes or findings.

According to Stake (2006) the final goal of the multiple case study is to aggregate and comparatively analyse the individual case findings in order to conclude cross-case assertions about the 'quintain' or major issue. To make generalizations about these cases this study all of the themes generated from the categories formed and following the case-by case analysis were used to conduct the cross-case analysis (see appendix *f* for cross-case data tables). Themes salient across all cases were noted as well as those that were extremely different.

Themes were generated from the categories formed and the final analysis was built around the generated themes following the case-by case analysis, all themes are used to conduct the cross-case analysis. Themes salient across all cases will be noted as well as those that were extremely different.

Delimitations of the study

1) Samples in this case are limited to one seven year rural secondary school in south western Trinidad.

2) The perceptions collected are limited to those of Technology Education teachers and exclude other stakeholders in education.

3) The sample size use was small thus limiting generalisations.

Limitations of the study

1) A limited timeframe was available for the conduct of the study.

2) Participants many withhold information or not be honest in their responses

3) Researcher bias and purposive sampling pose inherent challenges

4) The research does not have extensive training or experience. Therefore interview skills as well as bracketing of personal experiences may be a challenge

The table 3.2 below provides an overview of the research questions, sources of data, instrumentation, and data analysis procedures.

Research Design Matrix
Table 3.2

RESEARCH QUESTION	SOURCE OF DATA	INSTRUMENT USED FOR DATA COLLECTION	DATA ANALYSIS
How do the Technology Education teachers at Serenity High perceive student creativity?	The answers of all six(6) Respondents.	Questioner - appendix *a*.	Data Coding for cross-case thematic from the questioner in Appendix *a*.
What do the Technology Education teachers at Serenity High perceive as enablers to the development of student creativity?	Six(6)open-ended interviews Direct observation of each teacher Lesson Plans Scheme of Work Assessment	See appendix *b* for interview protocol. See appendix *d* for observation check lists. Field notes on Document analysis	Data Coding for Thematic case-by case analysis followed by cross-case thematic analysis of.
What do the Technology Education teachers at Serenity High perceive as barriers to the development of student creativity?	Six(6)open-ended interviews Direct observation of each teacher Lesson Plans Scheme of Work Assessment	See appendix *b* for interview protocol. See appendix *d* for observation check lists. Field notes on Document analysis	Data Coding for Thematic case-by case analysis followed by cross-case thematic analysis.

CHAPTER 4

Presentation of findings and Data Analysis

Presentation of findings and analysis for research question 1

How do the Technology Education teachers at Serenity High perceive student creativity?

In order to determine how teachers perceive creativity they were asked to produce responses in writing to the following three questions:

- ➢ a) How do you define creativity?

- ➢ b) Do you consider yourself to be creative?

- ➢ c) Describe the characteristics of a creative student?

The responses to question 1 was analysed separately from those of questions 2 and 3.

Presentation of findings and analysis of responses to question a.

Since each of the respondents gave a different definition of creativity. The themes emerging from a cross-case thematic analysis of the definitions revealed that they perceived creativity as: *the ability to problem solve*; *the ability to use the imagination; and the ability to develop or produce something.* See Table 4.1 below for verbatim samples.

Table 4.1	Cross-case themes teacher's definition of creativity.
Theme	Verbatim Samples of Participants Definition of Creativity
the ability to problem solve	*Tim :* "Creativity is needed when making decisions to problem solve, it is the competency required to manage one`s own learning and to work in groups." *Collin:* "The ability to recombine elements of previous experience, for problem solving in a new situation".
the ability to use the imagination	*Cindy :* "The ability to bring your imagination to life." *Natalie:* "Using your imagination to do something, it is also the ability to communicate ideas to solve problems."
the ability to develop or produce something	*Peter:* "The ability, to use tools, materials and equipment's to make recreate, repair, modify or develop new things". *Jane:* "The ability to make something that is useful with minimum resources."

"Problem solving".

Though problem solving is not creativity it can lead to creativity. However it is important to note that not all problem solving is creative in nature.

"Imagination".

Though the nature and status of imagination as a concept related to creativity is not always clear in many popular definitions of creativity the NACCCE (1999) in its definition of creativity recognises 'imagination' within its functional definition as a contributor to the characteristic of 'originality'.

"The ability to produce something".-

Whilst this phrase is somewhat ambiguous a literal interpretation may refer to what Runco (2003) calls a *"productivity bias".* According to Runco (2003) the latter refers to the production of unambiguously creative works at the expense of the development of students` "creative potential" through various modes of creative expression such as creative thinking and creative problem solving.

➢ Presentation of findings and analysis of responses to the following questions b and c :

- ▪ b) Do you consider yourself to be creative?
- ▪ c) Describe the characteristics of a creative student?

Whilst all of the Technology Education teachers interviewed thought of themselves as being creative their descriptions of the characteristics of creative students shared a few common descriptors. An analysis of their responses showed that the respondents' perceptions of creative student share the following themes in terms of the characteristics of creative students ie that they are: *questioning, persistent, imaginative, risk taking* individuals (see Table 4.2 below). However some of the more unique descriptors of creative students such as *positive, artistic, able to make something*

beautiful, generous and having a sense of humour suggest that some teachers have

misconceptions about the characteristics of creative students and their tendencies.

Table 4.2	
Cross-case themes for teachers` descriptions of a creative student	
Theme	Verbatim Comment/descriptor
Questioning	Natalie: " ask a lot of questions" Collin : "curious" Cindy : "Constantly searching for answers to their questions"
Imaginative	Cindy : "They are imaginative", Natalie: "think outside the box" Collin : " they are imaginative " Tim: " they see thing differently because they are dreamers"
Risk taking	Peter : "willing to try new things" Cindy: "not afraid to be wrong" Tim : "pioneers" Collin "fearless and challenging" Jane : "always willing to take a chance"
Persistent	Jane: "ready to keep truing if unsuccessful" Peter: work long and hard to solve problems Natalie : " have self-control " Jame: Hardworking-willing to go the extra mile

Presentation of findings and analysis for research question 2

Research question 2: *What do the Technology Education teachers at Serenity High perceive as enablers to the development of student creativity?*

From the analysis of the data collected for research question 2 from several sources across each case the themes that emerged from showed that teachers perceive the IDEATE problem solving model, student collaboration, authentic assessment and supportive teacher attitudes as enablers to the development of student creativity in Technology Education.

Problem solving Model or the IDEATE model

Five out of the six Tech Ed teachers interviewed mentioned the use of the problem solving or IDEATE method as an enabling strategy that in the development of student creativity see *Table 4.3* for verbatim accounts.

The six stages of the IDEATE problem solving model / Technology Process used by these Technology Education Teachers in Trinidad and Tobago are: I- identify the problem, D- define the problem, E - explore possible solutions, A - access the various solutions, T - Try-out and Test the solutions and E - Evaluate the solution the problem to design and construction a wide range of creative items MOE,(2008) are used within a problem based learning activity to help students to design and produce a solution to an identified problem.

Peter, Natalie, Tim and Collin all suggest that what makes the IDEATE model an enabler to creativity development is its ability to challenge students to solve problems

through a systematic approach. However Cindy highlighted the design feature of the IDEATE model as being yet another aspect that allows it as an enabler to student creativity development. See table Fig 4.3 for verbatim statements.

Table 4.3
Theme 1 :- **Problem solving Model or the IDEATE model**
Peter : "*we stimulate students creativity through the use of problem solving challenges and every Tech Ed class is about problem solving* "   **Natalie:** "*th*e *IDEATE model when done right can help guide students to solve problems creatively*".   **Tim:** "*I don`t spoon feed my students, the purpose of the IDEATE model is to help them discover answers for themselves and that experience helps them to be creative*"   **Colin:** "*I tell them to be creative and I give them a challenge to problem solve that works*"   **Cindy:** "*the design is by nature creative and the IDEATE problem solving model allows students to be creative.*"

Collaboration

Four of the six Tech Ed teachers perceive student collaboration as an enabler for creativity development because it reduces risk, allows for the exchange ideas, correction of concepts or clarification of ideas, and the expansion of students' knowledge base to improve both the quantity and level of creativity displayed (see Table 4.4 below)

Table 4.4
Theme 2: - Collaboration
Tim : "*Students feel safe to be creative when they work in groups, the risk is reduced*"
Jane : "*When groups work well its often because each person has the opportunity to explore his or her creative potential for some people this is about the pleasure of the exchange whilst for others the communication clears up ideas to facilitate design and problem solving.*"
Peter: "*Group work allows students to expand their knowledge base effortlessly as they make the essential conceptual links for creative output.*"
Cindy: "*My students benefit from the ability to trash out their ideas in groups and this improves both the quality of the final solution and the level of creativity*

Authentic assessment

The teachers who perceived authentic assessment as an enabler to student creativity suggested it aids creativity development because it provides flexible, performance based, enjoyable, challenging, interesting and stress-free activities that give students the opportunity to use their creativity to show what they've learned see Fig4.5 below for verbatim examples.

Table 4.5 **Theme 3:- Authentic assessment**
Peter: _The portfolio_ that these students have to do is _ah flexible thing_ and so they does get marks for creativity. To get those marks they must be creative. **Jane:** _Since students_ _deal with real word challenges_ the _assignments are practical_ and _interesting_ and this _motivates them_. So the end products are often original and useful **Cindy:** What they do for marks in Tech Ed _don`t feel like a test_ so they _enjoy the_ _challenges_ and you _could be creative_ when you enjoying something **Collin :** In Tech Ed our students are able to use a _wide range of mediums_ _to analyse_ _what they've learned_   and show their creativity it's _not just pen and_ _paper_ sometimes it's _a role play_, other times it's _something they make with their_ _hands_ ,and the options change eg _they cook, plant , make household items_

Supportive teacher behaviours

Table 4.6 below contains the verbatim statements that suggest that teachers perceive supportive teacher attitudes as an enabler to creativity development. According to these teachers supportive teacher attitude enable creativity development because they helps to encourage, value and appreciate student creativity by creating a supportive safe environment for the development of creativity.

Table 4.6   Theme 4:- Supportive Teacher Behaviours
Jane: *"Tech Ed teachers need <u>encourage</u> their students to be creative by because they are not always expected to do so in other subjects. I like to emphasizes the differences of my students to encourage them to be <u>independent</u> ."*   **Tim:** *"The teacher must see activities such as, <u>group discussions</u> or <u>working in pairs</u> as ways to obtain creative solutions .You simply can`t put a stop to creativity when their collective <u>curiosity</u> comes together to solve a problem"*   **Cindy:** *"I try to <u>make the experience</u> fun and give students <u>independence</u> whilst still controlling their learning objectives that way they are excited to come to class and find out what we doing next." …….They also feel the relaxed so they can be creative as there is no pressure.*   **Natalie :** *"Well the teacher simply have to <u>encourage students to do their best</u> how important it is …it hard to promote what ………Yuh don`t know or believe in "*

These teachers believe that when teachers encourage student choice and accept students as individuals, they foster creativity by encouraging them to do their best.

Presentation of findings and analysis for research question 3

What do the Technology Education teachers at Serenity High perceive as barriers to the development of student creativity?

The Technology Education teachers at Serenity High perceive the following things as barriers to the facilitation of student creativity:

1) the lack of creativity training,

 2) the lack of financial support for resources

3) the lack of instructional time

4) the lack of an explicit curricula focus on creativity development within the Technology Education curriculum

Theme 1: Lack of Creativity training – The teacher perceptions shared in the context of this theme (see Table 4. 7 below) revealed teachers` frustration with the lack of opportunities for creativity training. Cindy highlighted the absence of creativity training in her recently completed teacher training. Whilst Tim and Natalie noted that the current Tec Ed training program needs to be incentivised and restructured.

Table 4.7 Theme 1: Lack of Creativity training
Collin: "*I was trained one for anything Tech Ed when the say we have to teach this thing we all went the workshop was interesting but it was not about developing student's creativity.*" **Jane:** "*No I never had any creativity training. Honestly I did not even know there was such a thing.*" **Tim:** "*Yes I think I need to be trained to do this thing …….but the ministry have a way it only putting these programs in the vacations that is not an incentive …….like the Tech Ed training is in the Easter vacation, that way you would have lost your whole vacation…. If the MOE want people train give them an incentive and a disincentive yuh know what ah mean.*" **Cindy:** " *I spent four years doing a degree for teaching this thing they could have had a creativity course as usual there is no planning we are expected to be magicians …*" **Natalie:** "*Ah don`t feel that I competent to develop no body creativity ah simply not trained for that ..*" **Peter:** "*I have not even been trained for Tech Ed yet …….what I doing is what I interpret from the things I read and am told to do……. So If it they have a creativity training I will do that too …..but for now I have no formal teacher training.*"

Theme 2: The lack of resources

The Technology Education teachers at Serenity High perceive that the lack of finance for appropriate safety resources, manipulative resource materials and ICT resources impairs their ability to facilitate student creativity (see Table 4.8) . This lack of resources was also noted in the observations in the field teachers (see appendix d and e)

Table 4.8 Theme 2: The lack of resources

Natalie: *"We are a practical subject and it always have some problem for us to get resources ,the children does have to buy their own most times... yes we.. creative some but we need help yuh ......could only do so much without money.."*

Peter: *"Ah don`t feel they serious about this thing the Tech Ed labs come yes , but we need more than just two glue guns over what 5 to six years,...."In this department now get its own projector but we sharing....... one projector between all of us that just frustrating .... when yuh want if all the time ....this subject is information based but we forever fighting to get the information to the students. ....Some have internet home but not all !.....*

Tim: *"We have no internet access on the IA block and this subject relies on the children getting access to online sources of data , when we go to block M the signal so weak yuh could hardly get a browser to come up.... we constantly working without things ......so creativity is a luxury for us"*

Collin: *It have real nice projects the children could do in Agri but everything is money so we try to be creative but it could only go so far." ......I just fed-up of it we get to a stage now where even the photo copies of the activity sheets are a problem ....creativity is not the problem ...access to technology is ....*

Cindy: *"Look just for safety alone the budget big but the children need protective wear noting fancy ....simple gloves, goggles if ah not getting them things it limits my ability to properly implement the curriculum so creativity must suffer."*

Theme 3: Lack of instructional Time

According to the data collected teachers perceive the development of student creativity as requiring additional or special time that competes with their other curricula demands, also time in the sense of block time tabling has been identified as being too rigid for creativity development (see Table 4.9)

Table 4.9   **Theme 3: Lack of Time**
Jane: *"all this is well an good when you sit to plan a curriculum but I don`t have time for most of the content I have to teach we have no internet here and it means I have to do presentations , photocopies etc. there simply is not enough time."*   **Tim:** *"The timetabling is a problem students start an activity and then the bell goes a double period is no time at all if they really have to be creative"*   **Collin :** **"***think that this subject is a good idea but it not for suited for schools with rigid block timetabling .....I always have some teacher angry with be because the children reach late to their class .....the fact is yuh simply can't have that rigidity when yuh want creativity.*   **Peter:** **"***people thing teaching this thing simple we have portfolios to develop and course marks to collect on a continuous basis sometimes yuh just don`t have time to consider creativity development yuh just want to meet yuh deadlines internal and external."*    **Natalie:** **"***Time is a problem ...in not time the children in and out of yuh class and when they leave most don`t work on their projects."*   **Cindy:** *"if yuh don`t know how to prioritise just about noting will get done especially if yuh the class big , with big groups yuh need more time to move around to work groups*

Theme 5: Lack of explicit curricula focus on creativity development

The data collected in the context of this theme illustrated teachers perception that creativity development was not an explicit or core focus articulated in the curriculum objectives, some made clear that their views was substantiated by the lack of opportunities for clear assessment of creativity and the negligible weight of creativity in the standardised assessment rubric of the NCSE exam (see Fig 4.10)

Table 4.10

Theme 5: Lack of an explicit focus curricula focus on creativity development

Jane: *"The syllabus don`t really stress this like the stress the essential learning outcomes so most people don`t stress creativity when they teach Tech Ed it's not really the teacher fault."*

Tim: *" The NCSE mark scheme only have a few marks for creativity any way we focus more on other areas with more marks"*

Cindy: *"The truth is I don`t always make creativity a priority the syllabus more what yuh to help the children problem solve so I make that the focus."*

Natalie: *"they need to restructure the curriculum for this thing to work it have too many other objectives competing with it …. When they say the focus is creativity we will operate to suit …..no body fussing over what they not getting rewarded to do … how yuh assessing that any way ?"*

Peter : *"I like to get creative work but I did not know it was an objective*

Summary of findings:

Table 5.1 Summary of findings	
Research question 1: *How do the Technology Education teachers at Serenity High perceive student creativity?*	The Technology Education teachers at Serenity High perceive student creativity as the ability to problem solve; the ability to use the imagination; the ability to develop or produce something. As such for them creative students are questioning, persistent, imaginative, risk taking individuals.
Research question 2 : *What do the Technology Education teachers at Serenity High perceive as enablers to the development of student creativity*	The Technology Education teachers at Serenity High perceive the IDEATE model/technology process, collaborative learning, authentic assessment and supportive teacher behaviours as enablers to the development of student creativity in Technology Education.
Research question 3 : *What do the Technology Education teachers at Serenity High perceive as barriers to the development of student creativity*	The Technology Education teachers at Serenity High perceive the lack of the following things as barriers to the facilitation of student creativity : 1) creativity training, 2) financial support for resources such as ICT, 3) time 4) an explicit curricula focus on creativity development in the Tech Ed curriculum

CHAPTER 5

Discussion of Findings and Recommendations

Research Question 1-*How do the Technology Education teachers at Serenity High perceive student creativity?*

Discussion of findings and recommendations

To collect data for this question each teacher was asked to define creativity and list some of the characteristics of creative students. Whilst *originality* was frequently mentioned within the definitions received none of the respondents used *task appropriateness* within their definition of creativity. This finding is troubling as it suggests that teachers may hold the misconception that creativity is only about "originality". According to Beghetto & Kaufman (2013) left unchecked this misconception can do more harm than good as there is a risk that such teachers may allow opportunities for creativity development to compete with academic learning instead of complementing it.

Also an analysis of the other themes within the different definitions showed that teachers 'perceived creativity as also involving *problem solving*, *imagination* and the *ability to produce something*. The lack of a consistently shared or standardised definition of creativity among educators is consistent with the findings of Spencer et al., 2012. Moreover the findings of researchers Ferrari et al. 2009; Rogers & Fasciato 2005; Spencer et al., 2012 suggest that the absence of a functional definition of creativity impedes creativity development as it makes assessment difficult and undermines teachers` commitment to creativity development as a whole.

Despite this lack of a standardized definition most of the teachers interviewed shared common elements in their descriptors of a creative. However whilst they tended to agree that creative students are often *imaginative, curious, risk taking and persistent* a closer look at some of the other descriptors used e.g. *positive, artistic, able to make something beautiful, generous and having a sense of humour* suggest that some teachers still have misconceptions about the characteristics or tendencies of creative students. Thus the findings is consistent with the research finding of Aljughaiman & Mowrer-Reynolds, 2005; Lee and Seo, 2006; Morais & Azevedo, 2011 that show evidence of teacher misconceptions about creative students.

Recommendation

Therefore it is recommended that the administration and staff of Serenity High agree upon and put into place a functional definition for creativity that recognises both originality and appropriateness as its two fundamental characteristics. Teachers also need creativity training so that they can have consistency in terms of curriculum design and implementation and assessment.

Research Question 2. -*What do the Technology Education teachers at Serenity High perceive as enablers to the development of student creativity?*

Discussion of findings and recommendations

The finding for this research revealed that the Technology Education teachers at Serenity High perceived *the IDEATE model/technological design process, collaborative learning, authentic assessment and supportive teacher behaviours* as enablers to the development of student creativity in Technology Education. The emerging themes are

encouraging as most of they correspond to research the findings of Ferrari, et al 2009; Davies, et al., 2013.

The IDEATE Model

The respondents identification of the IDEATE model / technological design process as an enabler to the development of student creativity is consistent with the findings of Rutland & Barlex , 2008 ; McCormick & Davidson, 1996; Warner & Gemmill, 2011; Wong & Siu 2012 . However since it was observed that the quality of problem based learning PBL was poor (the inquiry based teaching learning approach used with the IDEATE model) it is recommended that efforts be made to provide teachers with regular professional development so improve their *creative teaching* competence.

This is especially important since the research findings of Sawyer (2004) and Beghetto & Kaufman (2011) suggest that creativity development is associated with a shift towards non-prescriptive inquiry based teaching learning approaches that allow for curriculum flexibility through "disciplined improvisation".

Collaborative learning and cooperative learning

Teachers identification of *collaborative learning and cooperative learning as enablers to developing creativity* is consistent with the findings of Johansson,2004; Sawyer, 2004; Burgess & Addison 2007 both collaborative learning and cooperative learning are enablers to the development of student creativity. In particular the findings of Burgess & Addison (2007) show the presence of collaborative activities involving students of different abilities can be very effective in stimulating their creative abilities. Therefore it is recommended that these teachers receive need continuous professional

development in collaborative and cooperative teaching learning approaches to facilitate the development of students' group creativity.

Alternative Assessment

Teachers perception that alternative assessment is an enabler to the development of student creativity is consistent with the research findings of Rogers & Fasciato, 2005; Spencer et al., 2012; Lucas et al, 2013. However given the lack of an explicit curricula focus on creativity development and the negligible weighting of creativity within NCSE it is recommended that the administration and staff or Serenity High make a commitment to formatively assess student creativity through alternative forms assessment. This way they can provide students with the necessary feedback to guide the development of their own creativity.

Supportive teacher behaviours

This theme is consistent with the research findings of Cropley, 1997; Soh, 2000 ; Cremin et al.,2006; Gkolia et al.,2009; Grohman & Szmidt, 2013   which show that teachers who *teach for creativity* engaged in behaviours that empower students such as encouraging creative thinking,   students self-evaluation, independence, collaboration whilst listening to students' suggestions and questions. Therefore to increase the likely hood of teachers both *teach creatively* and *teaching for creativity* it is recommended that teachers receive regular creativity training.

Research Question-3

What do the Technology Education teachers at Serenity High perceive as barriers to the development of student creativity?

Discussion of findings and recommendations

According to the themes emerging from research question 3 teachers perceived that the barriers to the development of student creativity in Technology Education to associated with the lack of the following: creativity training, financial support for resources, time, and an explicit focus curricula focus on creativity development.

The Lack of Creativity Training

This finding is consistent with the findings of Aljughaiman &Mowrer-Reynolds, 2005 and Beghetto, 2007 because teachers need a broad understanding of the nature of creativity Kaufman & Beghetto (2009) to facilitate the development of student creativity. Therefore it is recommended that the Tech Ed Teachers at Serenity High be provided with continuous creativity training to ensure the development of an effective creative pedagogy and a professional learning culture and school ethos that values student creativity.

The lack of resources

There is strong evidence to show that the availability of a wide range of appropriate materials, tools and other resources can stimulate creativity when student are involve the making of artefacts (the products of technology) by Addison et al.,

2010; Robson & Jaaniste, 2010; Wood & Ashfield 2008; Gkolia et al., 2009, Bancroft et al., 2008; Feldhusen & Treffingner, 1980 and Grainger et al., 2007; Gandini et al., 2005).

According to Addison et al. (2010) where teaching-learning activities involve the making of artefacts it is very important for students to have access to a full a range of manipulative material, as well as technical and reference resources, both inside and outside of timetabled hours in order to stimulate their creativity. Also the findings of Wood & Ashfield (2008) showed that pupils ICT interactions provided them with opportunities for developing their creativity through exploration and imagination. Whilst the findings of Feldhusen and Treffingner (1980) show that the availability of appropriate resource materials and equipment that will spark interest and encourage the experimentation and questioning necessary for creativity to emerge.

Recommendation:

The technology education teachers at Serenity High can increase their resource availability by forming creative collaborations both internally and externally. External support from stake holders in the wider community is important. However Serenity High as an organisation must develop a professional culture where teachers plan lessons together, learn from each other and share ideas and resources in order to be able to maximise the funds available for the acquisition and use of resources.

The lack of time

This research finding is consistent with that of Webster et al (2006) who also identified 'time' as a barrier to the development of student creativity in the implementation of design and technology activities.

Recommendation: Teachers need to provide an incubation period(s) as part of the implementation of the IDEATE technological process in the classroom, so that children's creativity can be fostered. Also Beghetto & Kaufman (2011) suggest that teachers should use 'disciplined improvisation' to *teach for creativity* as it adds unique or fluid features to the learning of academic subject matter. The strategy involves reworking the "planned" curriculum in relation to unanticipated ideas conceived, shaped and transformed under the special conditions of the "lived" curriculum so as to facilitate the development of student creativity in the teachable moments (Beghetto & Kaufman, 2011)

The lack of an explicit curricula focus on creativity development in the Tech Ed curriculum

This theme is consistent with the findings of Spencer et al. (2012) who note that it is common for many education systems to make only implicit references to creativity within general objectives and rarely defined or assess it.

Recommendation:

Serenity High can overcome this barrier by internally making creativity a priority. To facilitate students' creativity development the administration of Serenity High to encourages the use of formative creativity assessment tools not only in Technology Education but other disciplines as well. A school wide focus on creativity development would engender a creative ethos and increase the likelihood of learners displaying the full

range of their creative dispositions in a wide variety of contexts. This however would require consultation and dialogue with all stakeholders.

Conclusion

Overall the findings indicate that the teachers of Serentiy High are willing to develop student creativity despite the identified barriers. From the enablers identified it is possible to conclude that whilst teachers are capable of making some effective efforts at developing student creativity however there is room for improvement. Especially since respondents to this study simultaneously highlighted the both lack of an explicit curricula focus on creativity development in the Tech Ed curriculum as a barrier to creativity development and the use of the IDEATE technology process / PBL model as an enabler Tech Ed teachers need to focus more on *teaching for creativity*. Therefore even though there is still work to be done all is not lost as Beghetto (2010) notes that creativity is a robust human trait which can bounce back from even the most creativity-stifling experiences.

Suggestions of Future Research:

1. There is need for future research to focus on the relationship between ITC availability and creativity development in Technology Education.

2. There is need for research to focus on the relationship between school leadership and teachers creativity fostering behaviours with Tech Ed .

3. There is need for research to focus on the effectiveness of the implementation of the IDEATE model in developing student creativity.

APPENDED EVIDENCE LIST

Appendix a- Informed Consent Form

Appendix b- Questioner

Appendix c- Teacher Interview Protocol

Appendix d- Observation Checklists and Reflective Journal Excerpt

Appendix e- Observation Worksheet

Appendix ƒ- Data Analysis Worksheets (1-5)

Appendix a- Informed Consent Form

Dear Participant,

You are invited to participate in research study that will attempt to understand Technology Education teacher perspectives of the barriers faced in facilitating the development of student creativity. The following information is provided in order to help you make an informed decision whether or not you would like to participate. If you have any questions please do not hesitate to ask. Please read through each section thoroughly. For further detail or explanation of the project, contact Natasha John at 797-5670. You are required to give to indicate if you have decided to participate in this project, please indicate this on the last page of this form.

Project: Teacher`s perceptions of the enablers and barriers to the development of student creativity in the implementation of the SEMP technology education curriculum: A Multiple Cases study of Serenity High

Purpose of the Project:

This study will investigate the perceptions of Teachers of Technology Education who serve as facilitators to the development of student creativity in the classroom.

Procedures or Protocols:

You will be required to participate in an interview and allow the researcher to observe you teach. The interview will be audio-recorded and is expected to take approximately one hour of your time. An audio recording of the interviews will be made to ensure that the all the thoughts and ideas shared will be collected completely .During this interview you will be asked a series of questions designed to allow you to share your perceptions and experiences as a Technology Education Teacher. Additionally, you will be asked to complete a demographic data sheet and answer a few questions on the topic. The observation will take approximately 45 minutes of your time and will take place after the interview at an agreed upon schedule three times. You will also be asked to provide a sample lesson plan and a copy of your scheme of work. These documents will be copied and any identifiable information will be deleted and the original document will be returned to you at least two days after the observation.

Risks and/or Discomforts: There are no known risks or discomforts associated with this research.

Benefits: Teachers who participate in this project will receive a final report of the results of the study. The results of this study may be used by the teachers, administrators or

larger educational community to help reduce the barriers to creativity development in the classroom.

Confidentiality: All interviews will be conducted in a private and respondents will be assigned a pseudonym to insure that their identities are protected . The audio-recording will be assigned the pseudonym that you pick during the interview. The demographic sheet will also only identify you buy the pseudonym that you pick. Once the interview is transcribed, the audio tapes and interview transcripts you provided will be kept safely and only the researcher and research supervisor will have access to them. The information obtained during this study may be published in scientific journals or presented at scientific meetings but the data will be prepared as aggregated data.

Compensation: You will not receive any type of compensation for participating in this study.

Opportunity to Ask Questions: You may ask any questions concerning this research and have those questions answered before agreeing to participate or during the study. Or you may call Natasha John at any time, 797-5670 or email Natasha_john78@yahoo.com If you have questions about your rights as a research participant that have not been answered by the investigator or report any concerns about the study, you may contact the School of Education University of the West Indies, St. Augustine, Trinidad and Tobago.

Freedom to Withdraw: You hold the right to refuse to participate in this study or withdraw from the study at any time without penalty.

Consent: If you wish to participate in this study, you will be interviewed, observed, asked to filled out a demographic sheet and provide a sample lesson plan and a copy of your scheme of work .You are voluntary making a decision whether or not to participate in this research study. Your signature certifies that you have decided to participate having read and understood the information presented. You will be given a copy of this consent form to keep.

_____   _____
Signature of Participant   Date
I hereby give consent to audio record my interview.

_____   _____
Initials of Participant   Date

In my judgment I am voluntary and knowingly giving informed consent and possess the legal capacity to give informed consent to participate in this research study.

_____   _____
Signature of Investigator   Date

Appendix b-Questioner

Pseudonym _____   Length of Service _____

Instructional Level _____   Teacher Assessment_____

Academic Qualification_____

How do you define creativity?

_____

_____

_____

_____

Do you consider yourself to be creative?

_____

Describe the characteristics of a creative student?

_____

_____

_____

_____

_____

_____

_____

Appendix c-Teacher Interview protocol

Interview protocol

1. To what extent is the development of student's creativity an important educational objective for you as a Technology Education teacher?

2. How can Technology Education teachers play a key role in the development of students' creative potential?

3. What are the abilities, values, attitudes, behaviours you perceive that help students to realise their creative potential in Technology Education?

4. What tools, strategies or practices do you perceive help to supports the development of student's creativity in Technology Education?

5. What are some of things that prevent teachers form being able to facilitate the development of student's creativity in Technology Education?

6. How does the organisational climate at Serenity High influence your efforts to develop student creativity in Technology Education?

7. To what extent is a student's self- image able to influence the ability to realise his or her creative potential?

8. To what extent do you feel competent about your ability to facilitate the development of student creativity in the classroom?

9. How does ICT influence your efforts to facilitate the development of student creativity?

Appendix d - Observation Checklists and Reflective Journal Excerpt

Inquiry Based Learning Checklist

Teacher _____   Instructional Level _____

Date   _____   Observation Time _____

Inquiry based learning (Feldhusen & Treffingner,1980)	Shown Very Well	Observed But More emphasis need	Not Observed
Teacher provides the initial experience to interest ,students in inquiry about the problem, concept, situation or idea			
Teacher provides the students with manipulative situations and materials to begin avenues of exploration			
Teacher supplies information sources for students` questions			
Teacher provides materials and equipment that will spark and encourage student experimentation and production			
Teacher provides the time for students to manipulate, discuss ,experiment ,fail, and succeed			
Teacher provides guidance ,reassurance and reinforcement for students ideas and hypotheses			
Teacher rewards and encourages acceptable solutions strategies to provide a supportive positive climate for spawning the best results.			

COMMENTS /OVERALL FEEDBACK/ SUGGESTIONS:

_____

_____

_____

Checklist of Creativity Fostering Behaviours

Teacher _____   **Instructional Level** _____

Date _____   **Observation** Time _____

Creativity Fostering behaviours *(Cropley 1997)*	Shown Very Well	Observed But More emphasis need	Not Observed
Teacher encourages students to learn independently			
Teacher has a co-operative, socially integrative style of teaching			
Teacher motivates students to master factual knowledge as a solid base for divergent thinking			
Teacher delays judging students ideas until they have been thoroughly worked out and clearly formulated			
Teacher encourages flexible thinking			
Teacher promotes self-evaluation in students			
Teacher offer students opportunities to work with a wide variety of materials and under many different conditions			
Teacher helps students to cope with frustration and failure so that they can have the courage to try the new and the unusual.			

COMMENTS /OVERALL FEEDBACK/ SUGGESTIONS:

_____

_____

_____

Consistency of observed results on inquiry based learning and reflection

	Frequency		
Inquiry based learning *(recommendation Feldhusen and Treffingner,1980)*	**Shown Very Well**	**More emphasis need**	**Not Observed**
Teachers provided the initial experience to interest ,students in inquiry about the problem, concept, situation or idea	1	5	
Teachers provided the students with manipulative situations and materials to begin avenues of exploration	2	4	
Teachers supplied information sources for students` questions	4	2	
Teachers provided materials and equipment that will spark and encourage student experimentation and production	1	5	
Teachers provided the time for students to manipulate, discuss ,experiment ,fail, and succeed	3	3	
Teachers provided guidance ,reassurance and reinforcement for students ideas and hypotheses	1	5	
Teachers rewarded and encouraged acceptable solutions strategies to provide a supportive positive climate for spawning the best results.		6	

Refection on inquiry based teaching learning observations.

The inquiry based teaching learning experiences observed generally involved the application of the engineering process / technology process or IDEATE model. Often the overall quality of the experiences observed was limited by the lack of availability of resource materials, ICT and internet access. Even in classes where most students had functioning laptops the lack of internet access eroded the quality of inquiry that could have stimulated the iterative phases of the IDEATE model/ engineering process. Also the phases of the IDEATE model were often poorly scaffolded thus impairing the possibilities for creative thinking and meaningful learning. Often IDEATE model was limited to a series of linear steps which teachers simply wrote on the board. As a result the process was not iterative and students generally produced a single solution without feeling the need to test / retest and obtain the best possible solution. However given the lack sufficient quantities of manipulative material or resources for the production of artefacts (the products of technology) the ability to test and retest their artefacts remains a luxury. Also it was observed that very few teachers modelled the technological design process or IDEATE stages so that students could benefit from the situated learning of the creative behaviours and metacognitive process that accompany each of the IDEATE stages.

Consistency of results from observation checklist

	Frequency		
Creativity Fostering behaviours *(Cropley 1997)*	**Shown Very Well**	**More emphasis need**	**Not Observed**
Teacher encourages students to learn independently		6	
Teacher has a co-operative, socially integrative style of teaching	4	2	
Teacher motivates students to master factual knowledge as a solid base for divergent thinking	3	3	
Teacher delays judging students ideas until they have been thoroughly worked out and clearly formulated	2	4	
Teacher encourages flexible thinking		4	2
Teacher promotes self-evaluation in students		3	3
Teacher offer students opportunities to work with a wide variety of materials and under many different conditions		2	4
Teacher helps students to cope with frustration and failure so that they can have the courage to try the new and the unusual.	1	5	

Refection on observations of teacher creativity fostering behaviours

.

All of the Tech Ed classes observed at Serenity High utilised group work and students participation with the group activities were high .The quality of the teacher to student feedback /scaffolding was however week and this contributed to the loss of opportunities for demonstrations of creativity fostering behaviours such as flexible thinking ,self-evaluation . Students had a lot of independence however this often contributed to an unstructured teaching learning experience that left room for some students to be distracted from the teaching objective. Opportunities for divergent thinking and co-operative learning were not always feed by students' mastery of the required content knowledge thus diminishing the quality of these experiences. Teachers generally need help facilitating group creativity.

Appendix e- Reflective Journal Excerpt

Photocopies of the activity sheets used in the lessons identified the following a content standard , *context for the design , challenge ,*specific learning outcomes most of which included a *design challenge ,*as well as *suggested resources* for students to engage in inquiry as well as a *suggested practical resource list .*These sheets were photocopied and given out prior to class.

Despite the *excellent quality of the lesson plans* viewed students were *not always able to have a high quality inquiry based learning experience* because they had to do research at home or in the library, it was also noticed that access to *laptops were resources were limited especially among the form 3 students* (teacher explained that most were in need of repair), also there was no internet access and printers. Teachers were *rarely seen using ICT* to aid in teaching.

*Students were seen working in group*s, where they *comfortably shared ideas* in a very informal at times playful manner most *teachers seemed to allow this type of flexibility* so much so that persons often moved between groups observing the ideas and sharing feedback on the activity. *Materials used seemed often recycled and cheap which on some level expressed creativity.* Students we however *largely responsible for coming prepared with their own materials or ingredients depending on the area.* Most *classes seemed unstructured as the journaling or writing was generally given for homework* as class time seemed mainly for the practical however *students not working on assignments out of class and not completing portfolios.* Though students would generally be *reminded of the IDEATE stage*s at the beginning of a challenge however the stages were not *clearly scaffolded* and *teachers rarely modelled the use of the model. Creativity is identified in the rubrics* for each challenge weighted as highly as problem solving in fact the two are separate *not conceptualised as creative problem solving.*

Appendix f- Data Analysis Worksheets

Worksheet 1. Analyst's Notes while reading an individual case report
Case 1 _____

Synopsis of case:	Case Codes and Categories :
	I.
	II.
	III.
Uniqueness of case situation for program/phenomenon:	IV.
Relevance of case for cross-case Themes: Theme 1_____ Theme 2_____ Theme 3_____ Theme 4_____ Theme 5_____ Theme 6_____	Comments:
Case Findings:	
Possible excerpts for cross-case report: Transcript Page #	

Multicase Codes and categories and themes for enablers

Codes and Categories for Enablers

CODES	CATEGORIES
Discovery Inquiry –not spoon feeding Iterative Stages, Steps Constructivist learning	Inquiry based learning
Design Challenge Problem solving Explore possibilities/ ideation	problem solving Model
Group work Learning from each other Reduce risk Concept building	Social learning
Fun Bonding Comradery Competition	Peer Support and comradery
Portfolios Role play Design Hands-on activities	Performance based
Realistic and interesting Don`t feel like a test Real problems and real solutions Stress-free	Fun and practical
Safe risk free flexible	Tolerance
Value creativity Make it Fun Creative freedom motivation	Encouragement and motivation

Themes Formed From Categories for Enablers

CATEGORIES	THEMES
Inquiry based learning problem solving Model	Problem solving model or IDEATE model
Social learning Enjoyment Peer teaching	Collaboration / cooperative learning
Performance based Fun and practical	Authentic assessment
Motivation/Encouragement Tolerance Independence Curiosity Collaboration	Supportive teacher attitudes Supportive teacher behaviours

Multi-case codes and categories for inhibitors

CODES	CATEGORIES
Classroom layout limits group work Creative behaviours not modelled by teachers Limited teacher –student interaction Grouping not structured to ensure success members often unclear on their roles. Teachers rarely used ICT as a teaching tool	Lack of creativity fostering behaviours Lack of scaffolding for inquiry based learning Need for training to facilitate collaborative learning Need for training to facilitate group creativity Teacher –centred experience Need for ICT training
Ideas are not tested Need to see more Design solutions Need for more experience with different manipulatives to improve the solutions Insufficient tools and protective gear	Insufficient opportunities to manipulate material Better quality materials required More access to tools and protective gear
45 min periods No triple periods Lack of time to test ideas Lack of time to manipulate and access alternative resources	Each IDEATE phase needs more time for greater emphasis Lack of time IDEATE too linear , insufficient time for iterations
Syllabus has no definition for creativity Creativity only assessed as an aesthetic objective Weight of creativity on assessments is negligible problem solving is the primary focus of all activities	Curriculum does not focus on creativity development Not all problem solving is creative problem solving Lack of opportunities for creativity assessment

No internet access. Problems getting regular access to overhead projector. Photocopies limited. Lack of computers among form 3 students.	technology need to save time Educational objectives poorly communicated Limited opportunity for student independent learning

Themes Formed From Categories for inhibitors

CATEGORIES	THEMES
Lack of creativity fostering behaviours. Lack of scaffolding for inquiry based learning. Need for training to facilitate collaborative learning. Need for training to facilitate group creativity. Teacher –centred experience. Need for ICT training.	Lack of creativity training
Insufficient manipulate material. Better quality materials required. More access tools and protective gear.	Lack of financial support for resources
Each IDEATE phase needs more time for greater emphasis Lack of time Implementation of the IDEATE is often too linear and fast , there is insufficient time for meaning iterations	Lack of instructional time
This Tech Ed Curriculum does not focus on creativity development. Creativity and Problem solving not the same thing and similarly not all problem solving is creative problem solving. Very little opportunity for creativity assessment. We test what we teach.	Lack of an explicit focus on creativity development
Technology need to have ICT stimulate creativity save time. Educational objectives poorly communicated. Limited opportunity for student independent learning.	Lack of ICT support

The consistency of themes in relation to research question 2

Research Question 2: *What do the Technology Education teachers at Serenity High perceive as enablers to the development of student creativity?*

Consistency of Cross-Case Themes for research Question 2	Evidence in Cases					
	PETER	NATALIE	CINDY	JANE	TIM	COLLEN
1) IDEATE problem solving model	✓	✓	✓		✓	✓
2) Collaborative learning	✓			✓	✓	✓
3) Authentic assessment	✓	✓	✓	✓		✓
4) Supportive teacher behaviours		✓	✓	✓	✓	

The consistency of themes in relation to research question 3

Consistency of Cross-Case Themes for Research Question 3: *What do the Technology Education teachers at Serenity High perceive as barriers to the development of student creativity?*						
Cross-Case Themes for research Question 3	**Evidence in Cases**					
	PETER	NATALIE	CINDY	JANE	TIM	COLLEN
1) Lack of creativity training	✓	✓	✓	✓	✓	✓
2) Lack of financial support for resources	✓	✓	✓	✓	✓	✓
3) Lack of time	✓	✓	✓	✓	✓	✓
4) Lack of an explicit curricula focus on creativity development	✓	✓	✓	✓	✓	

Appendix g- Approval to conduct research

MINISTRY OF EDUCATION
EDUCATIONAL PLANNING DIVISION
CHEPSTOW HOUSE, 56 FREDERICK STREET, PORT-OF-SPAIN
TEL/FAX: 625-0806

December 30th 2014

Ms. Natasha John
11Righteous Lane Ext
Pinto Road
Arima

Dear Ms. John,

Your request to conduct your research entitled **"Teachers' Perceptions of the Enablers and Barriers to the Development of Student Creativity in the Implementation of the Secondary Education Modernization Programme (SEMP) Technology Education Curriculum: A Multiple Case Study of a High School"** has been approved.

Attached is a letter of confidentiality, which is to be completed and returned to the Educational Planning Division of the Ministry of Education by the person conducting their research through the Ministry.

Yours Respectfully,

Mrs. Lisa Henry-David
Director (Ag.)
Educational Planning Division
Ministry of Education

MINISTRY OF EDUCATION
EDUCATIONAL PLANNING DIVISION
CHEPSTOW HOUSE, 56 FREDRICK STREET
PORT OF SPAIN, TRINIDAD & TOBAGO

I, ... Natasha   John ....

of ... University of the West Indies St Augustine.

(Association, N.G.O, School/University) solemnly and sincerely affirm and declare

that:

1. I will conduct research only in accordance with the approval granted by the

   Ministry of Education.

2. I will not, without due authority of the Ministry of Education in any manner

   whatsoever, publish or communicate any facts of information acquired during

   the course of my study / research or programs implemented by my organization

   / association.

3. I must treat with the strictest confidence all information that I obtain during the

   course of my research / study or programme implementation.

4. That a copy of all data so retrieved must be stored in full with the Ministry of

   Education whether published or not.

(Signed) ... Natasha John ....
                  Declarant

Declared before me this .... 31st .... day of ... December .... 20..14..

(Signed) ... Juldah Bahlan-Bissoo

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